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THE HEATING AND VENTILATING MAGAZINE

Cooperstown, N. Y. November, 1918 1123 Broadway, New York

ENGLAND'S FUEL-RATIONING ORDER

Provisions of New Regulations Limiting the Supply of Coal, Gas and Electricity to Domestic Consumers.

Great Britain has come to the rationing of coal and gas to the people throughout England and Wales. The new order, which is known as "The Household Fuel and Lighting Order" is dated June 28, 1918, and was promulgated by the Board of Trade under Defence of the Realm regulations.

The order extends to coal, gas, and electricity used for heating or cooking or for any other than industrial purposes, exclusive of lighting. It also extends to gas and electricity used for lighting purposes in connection with certain classes of buildings mentioned in the order. Where an industry is carried on in a dwelling house for instance, then such industry must comply with the order. The same is true of private plants for the generation of gas or electricity for consumption in a house. Laundries, bakehouses, dairies, greenhouses and industrial occupations of a domestic or quasi-domestic character are included, as are those premises where the total quantity of coal or its equivalent to be used in any year does not exceed 100 tons.

Coal is defined in the order as anthracite and all other kinds of which coke is a constituent. Fuel means coal, gas and electricity used for all purposes except lighting.

ALLOWANCES FOR FUEL AND LIGHTING.

Following are the allowances of fuel for dwelling houses, or flats or tenements in separate occupation, such allowances running for one year calculated from July 1:

Where the number of rooms occupied is:	The fuel allowance for the year shall not exceed:			
	A		B	
	Tons	Cwts.	Tons	Cwts.
Not more than 2....	3	10	3	0
3.....	4	0	3	10
4.....	4	10	4	0
5.....	5	0	4	10
6.....	6	0	5	0
7.....	7	0	6	0
8.....	8	0	7	0
9.....	9	0	8	0
10.....	10	0	9	0
11.....	11	0	10	0
12.....	12	0	11	0

and for every additional room 1 ton until a maximum of 20 tons is reached, thereafter any additional allowance not exceeding 1 ton per room shall be in the discretion of the local fuel overseer. Provided always that where the number of people habitually resident in a flat or tenement, etc., of not more than 12 rooms exceeds six, the scale allowance as determined by the foregoing table shall be increased 1 ton.

The two scales indicated in the table refer roughly to the northern and south-

ern sections of England, respectively. Wales is inluded in Scale A.

Consumers may take the allowance of fuel to which they are entitled either in coal, gas or electricity in accordance with the following rules:

(A) Anthracite shall count as fuel at the same rate as ordinary coal.

(B) Three tons of coke shall count as two tons of fuel, and so in proportion for other quantities.

(C) Briquettes not sold by weight and not exceeding 2½ lbs. each shall count as 1000 to the ton and so in proportion.

(D) 15,000 cu. ft. of gas shall count as one ton of fuel.

(E) 800 Board of Trade units of electricity shall count as one ton of fuel.

The quantity of fuel to be taken must be calculated to the nearest quarter of a ton. The allowance of fuel to be taken as coal shall not be less in any case than 2 tons, 10 cwts. Any quantity of fuel allowed in addition to 20 tons may be required to be taken either wholly or partly in coke.

ALLOWANCES FOR LIGHTING

In addition to the allowances for fuel, there is allowed for lighting the quantities of gas and electricity shown in the following table:

Where the number of rooms occupied is	The lighting allowance for the year shall not exceed either cu. ft. of gas	or B. of T. units of electricity
1, 2 or 3.....	7,500	120
4, 5 or 6.....	11,250	180
7, 8 or 9.....	15,000	240
10, 11 or 12.....	18,750	300
13, 14 or 15.....	22,500	360
16, 17 or 18.....	26,250	420
19, 20 or 21.....	30,000	480

Gas or electricity allowed for lighting under this clause may, at the option of the consumer, be used for other domestic purposes, but cannot be converted into coal. Where gas and electricity are both used for lighting the consumer may elect to take part of the allowance as gas and part as electricity, 750 cu. ft. of gas being taken, for this purpose, as equivalent to 12 B. of T. units of electricity and vice versa.

Rooms shall only count where furnished and in actual occupation, except that bedrooms furnished, but only occasionally occupied, shall count as rooms. The following shall not count as rooms: Sculleries, bathrooms, halls not used as sitting rooms, dressing rooms not used as bedrooms, boxrooms, cellars, pantries not containing fireplaces or stoves, storerooms, greenhouses attached to houses, and outbuildings.

Unoccupied dwellings, of course, are not considered and the allowance is cut down when there is a temporary cessation of occupation exceeding one month; also where a consumer has more than one place of residence.

Not more than one-third of the total allowance of gas and electricity for fuel or lighting purposes may be taken in any one-quarter of the year except in cases where the quarter appreciably exceeds a three-monthly period.

WHEN ADDITIONAL ALLOWANCES MAY BE GRANTED.

Additional allowances not exceeding 5 tons of fuel in a year may be granted to a household where the absence of an additional fire or additional heating or cooking or lighting is shown to cause material hardship on all or any of the following grounds:

1. The presence of aged or infirm persons, invalids or young children.

2. The occupation of separate rooms by lodgers.

3. The use of rooms for a business or profession in a dwelling house or other building used in connection therewith.

4. The necessity for the upkeep of fires and light during the night as well as the day by reason of the hours during which the householder or other resident is engaged at work.

5. Illness, but in this case the allowance shall be of a temporary character and a medical certificate is required.

Any additional allowance shall be in fuel or in such specific fuel as coal, coke, gas or electricity as the local fuel overseer may determine. An additional allowance or part thereof may be used for lighting.

Further additional allowances not exceeding 5 tons of fuel in a year may be granted on the application of householders where the supply is required for actual consumption in connection with any industrial or manufacturing process carried on in a dwelling house, such allowance to be distinct from the allowance just mentioned.

The occupier of a dwelling house or tenement exceeding 15 rooms, or the occupier of any building not used or only partly used as a dwelling house may make application to be assessed individually, having regard to his special requirements. In such cases there is required, among other things, the figures for his previous consumption within one or more of the three previous years. Such applicant may receive the maximum allotment.

ALLOTMENTS IN SPECIAL CASES.

The difficulty of making a general rule that will cover all cases is illustrated in one clause where the allotments of fuel and lighting supplies may be made in a "single assessment." Such cases include residential estates or farms where fuel and light is supplied to the tenants, to a block of flats or tenements where heat and light is supplied by the proprietor or manager, to a group of houses managed on a communal basis, to a dwelling house occupied by more than one household in common and to a dwelling house part of which is occupied by a sub-tenant.

Another special case is where fuel is required for the generation or production of gas and electricity not for public sale but for consumption in a building covered by the order. The order states that the allowance of fuel for such purpose shall be limited to the amount actually required for this purpose and that the fuel so allowed shall not be applied to any other purpose.

Fuel required for industrial purposes not within the scope of the order may be purchased with household fuel and in addition thereto, upon the declaration of the consumer as to the industrial purposes for which it is required.

Where it is known that an occupation is only temporary the order provides that allowances shall be for one or more months, in the discretion of the local fuel overseer, and shall be renewed from time to time. Also where the local fuel overseer has reason to believe that in any premises fuel or light or both are being consumed at an unreasonable rate, he may cancel the yearly allowance and in its place grant and renew from time to time an allowance of one or more months.

HOW THE REGULATIONS ARE ADMINISTERED.

In administering the provisions of the order a "local fuel overseer" is appointed for each locality by the local authorities. They are also to appoint a "local fuel and lighting committee" to be constituted as follows:

One member who shall undertake the duties of "coal merchants' supervisor" to be named by the coal merchants within the district; one member to be named by the coal dealers within the district; one member to be named by the gas companies and one member to be named by the electric companies.

If the local authority desires, one member may be named by the railway company having sidings through which coal is supplied within the district. The same applies to canal companies and similar carriers, but where such appointments are made an equal number is appointed by the local authorities. The local fuel overseer is also a member of the committee.

The general application of the order is under the supervision of the Controller of Coal Mines who is appointed by the Board of Trade.

HOW ALLOTMENTS ARE MADE.

Each fuel and light consumer is required to fill out an application which is then sent to a registered coal merchant or coal dealer. It is not necessary that the same coal merchant or dealer shall supply both coal and coke. The coal merchant or dealer then signs the application and certifies to the correctness of any particulars given by the consumer within his knowledge.

Each consumer is required to fill out an application for both fuel and light. The application for coal or coke, or both, are sent to a registered coal merchant or coal dealer. It is not necessary that the same coal merchant or dealer shall supply both the coal and coke called for in the application. The coal merchant or dealer then signs the application and certifies to the correctness of any particulars given by the consumer within his knowledge. Where gas or electricity is supplied by public gas companies, such company is deemed to have accepted the application for gas and electricity to such premises without further formality.

The application is then sent to the local fuel overseer who issues a requisition for fuel and lighting. This requisition provides separately for the delivery of coal, coke, gas and electricity, and the consumer elects in what form and proportion he desires to take his fuel and lighting allowances. The allowance of gas and electricity for lighting is added to the allowance of gas and electricity for fuel and the consumer may use such total allowance either for fuel or lighting as he desires.

The consumer may be required to give full particulars as to his premises, included the purpose for which fuel is required, previous consumption of fuel and light, coal and coke on hand available for use and other necessary particulars.

After satisfying himself that the particulars shown on a requisition are correct and agree with the application, the local fuel overseer issues certificates to the registered coal merchants or licensed coal dealers named thereon to supply such proper quantities of coal and coke required by the requisition and at the same time issue certificates to the gas or electricity companies for the supply of the proper quantities of gas and electricity.

A requisition does not in itself impose any obligation on a consumer to purchase the quantity of fuel and light stated, nor does the acceptance of a requisition by the coal merchant or coal dealer constitute a contract for the supply of the quantity of coal or coke stated. This also applies to the gas and electric companies.

When a registered coal merchant or licensed coal dealer has completed the delivery of coal or coke to any consumer he completes the declaration to that effect provided in the form of certificate and returns it to the local fuel overseer. Such consumer cannot then obtain any further supplies for that year except with the express permission of the local fuel overseer.

DUTIES OF CONSUMER.

Among the restrictions laid on the consumer is one that he must not consume in any quarter gas or electricity to an amount exceeding one-third of the total yearly amount. The stock of coal in his possession at the date of the requisition shall be deemed to be in full or part satisfaction for the coal requirements for the year. A consumer must not have in his possession at any time more coal than is sufficient to satisfy his allowance for a period of 12 months, and coal shall not be acquired for stock during the period from October 1 to April 30 without the assent of the local fuel overseer.

FIXING COAL PRICES.

The local fuel and lighting committee, with the approval of the Controller, may from time to time determine the

maximum prices of coal to consumers. In determining the maximum prices of coal, it is to be divided into classes or qualities following the usual practice of the trade and sold in accordance with such classes, but the Controller may require the coal to be mixed. A notice of maximum prices for both coal and coke shall be exhibited in a conspicuous position in all places where orders for coal are received and the charging of prices in accordance with such notice shall be conclusive evidence that such prices are approved and are correct.

PROPOSED COAL-RATIONING RULES FOR THE UNITED STATES

Allowances Designed for Heating, Cooking and Hot-Water Service in Residences, Flats and Apartment Houses.

(Final Draft of Report of Committee on Fuel Conservation, American Society of Heating and Ventilating Engineers.)

NOTE.—*The following rules are intended to apply not only to residences, flats and apartment houses, but to other buildings of residence where coal is used for heating, cooking and hot-water service and where a power plant is not in operation.*

The allowance of coal for heating purposes shall be made on the basis of the number of rooms heated, taking into account the locality, the number and age of persons occupying the rooms, living conditions, and the application of consistent judgment for determining the number of rooms upon which the allowance should be made.

The allowance of coal per family for cooking and hot-water service is determined by the number in family and reasonable conditions of use and requirement based upon established rulings.

RULE 1.—If a family require for its own personal use six tons of coal or less for heating and cooking purposes per season, the local Fuel Administrator may approve their application so that they will receive the full amount, without regard to the following rules.

RULE 2.—The basis of allowance of coal for heating per room per heating season shall be 1 ton for apartment houses or houses with two sides protected; ½ ton for houses with one side protected; 1⅓ tons for detached houses.

a. This allowance is the maximum where there are no children under 5 years, adults over 60 years of age, or invalids.

b. It is impractical to require heat to be shut off from rooms not necessary for family use, but allowance for coal for heating such rooms may be withheld by the local Fuel Administrator.

RULE 3.—In any locality having a higher average normal temperature than 40° F. for the months of Oct. 1 to May 1, as given by the nearest U. S. Weather Bureau station, the allowance of coal shall be 3% less for each degree that such average normal temperature is in excess of 40°. Likewise, in any locality having a lower average normal temperature than 40° F., the allowance of coal may be increased 3% for each degree that such average normal temperature is less than 40°.

RULE 4.—Rule 2 contemplates only a reasonable allowance of rooms in

general family use, including living rooms, libraries, dining-rooms, kitchens without coal ranges, necessary sleeping rooms, baths and pantries. Pantries or bathrooms are to be considered as one-half rooms each. In houses with three or four sides exposed, an allowance of one room shall be made for general halls and stairways.

RULE 5. Wherever occupants include children under 5 years, adults over 60 years of age, or invalids, the allowance of coal per room for heating may be increased 10%.

RULE 6. For cooking and hot-water service, the allowance per month is dependent upon the number in the family including boarders and servants, and shall be in accordance with the accompanying table:

The Committee's Letter of Transmittal.

Mr. O. P. Hood, Mechanical Engineer, Bureau of Mines, Department of the Interior, Pittsburgh, Pa.

Dear Sir:

The committee appointed in accordance with your letter of January 30, addressed to The American Society of Heating and Ventilating Engineers, has the honor to submit the attached set of rules for covering the limitations.

We wish to inform you that the committee appreciates the great variation in the heating requirements for domestic buildings, such as the size and exposure of rooms, construction and location of buildings, method of heating and condition of heating equipment, climatic condition of the location, quality of coal, efficiency of firing, together with the further complications of the extra fuel required for cooking and hot-water service.

We realize that the rules presented are open to criticism in that they are not based on scientific calculations, taking into account all of these variable factors, but the immense amount of technical as well as clerical work that would be required for the application of any very scientific calculations seemed to us to exclude a more complicated scheme.

All things considered, we are inclined to believe that it will be found that a simple set of rules similar to those suggested will come nearer filling the conditions than any other that we could provide.

It is probable that the rules may work greater hardships on large detached residences having a large number of living rooms, libraries, parlors, etc., with but comparatively a small number of sleeping rooms occupied, than upon any other class of buildings. We are also inclined to believe that there is a greater opportunity for saving coal in this than in any other class of domestic buildings. We do not recommend, therefore, that any special rule be made to cover these cases.

We have compared amounts of coal allowed under these rules with the actual amount burned in several hundred dwellings of all classes in almost every State of the Union. It is quite evident from our comparison that the personal factor of the operator of the heating system has a greater bearing than any other single factor; also the mental attitude of the occupants and their desire to maintain reasonably low temperatures and the closing up of the rooms not necessary to be heated has a greater effect upon the amount of fuel used than does the climate. The amount of coal allowed in the rules for many apartment houses, flats and other buildings for heating of water is considerably less than that normally used, but it seems that this saving may be effected without undue hardship.

Your particular attention is called to the desirability of a set of rules for the operation of domestic heating apparatus, and we suggest that some national organization be enlisted to see that proper operating methods are carried out. It would seem to us that such an organization as our newly-formed National Guard or Home Defense League, working in cooperation with heating manufacturers, heating engineers and heating trade, could be used for this work, as we believe that they could do no more patriotic service than the inspection of domestic buildings of all kinds to see that the heating apparatus and its operation conform to the rules suggested. They could make reports to the local Fuel Commissioner who could bring pressure to bear upon the consumer to operate his plant with the greatest efficiency.

Respectfully submitted,

J. I. LYLE,
Chairman.

ALLOWANCE OF COAL FOR COOKING AND HOT-WATER SERVICE.

Number of Persons	Maximum Coal Allowance for Cooking and Hot-Water Service where Range has Water Back, Pounds	Maximum Coal Allowance for Cooking only when range is not equipped with Hot-Water Back, Pounds	Maximum Coal Allowance for Hot-Water Service only when same is supplied by Separate Apparatus, Pounds
3	750	600	500
4	850	650	550
5	950	700	600
6	1050	750	650
7	1150	800	700
8	1250	850	750
9	1350	900	800
10	1450	950	850

NOTES: a. For special conditions outside of user's control an extra allowance may be made up to 10% of the above figures.
b. For double-oven ranges extra allowance may be made to meet conditions up to 30% of the above figures.

RULE 7. The allowance for cooking and hot-water service shall be provided only for the number of months during the year in which the family occupy the premises.

RULE 8. Regardless of other rules, the amount allowed for heating or cooking, or hot-water service, shall not in any case be greater than the amount used for the year ending April 1, 1918, unless some valid reason is given which is satisfactory to the local Fuel Administrator.

RULE 9. These rules are based upon the use of stove-size in anthracite, or run-of-mine in bituminous for heating, and nut size or run-of-mine for cooking and hot-water service. The allowance for other sizes shall be an amount equal to the same total money value.

RULE 10. No allowance shall be made for the heating of garages or other outbuildings, excepting where absolutely necessary for the protection of food products or livestock.

RULE 11. It is contemplated by these rules that the coal used according to these rules will have a thermal value of 12,500 B. T. U. per pound. Adjustments may be made where coal has a lower thermal value.

NEW HEAT TRANSMISSION TABLES

A Remarkable Compilation of Factors as Given by Leading Authorities Covering Latest Types of Construction.

By WILLIAM R. JONES,
Superintendent, Department of Buildings and Grounds, University of Pennsylvania.

II

EDITOR'S NOTE.—*The first series of tables, published in the October issue, covered single window, double window, single skylight glass, double skylight glass, single window (wire glass), single window (double glass), single monitor glass, window glass wet, brick wall, brick wall (plastered one side), masonry wall with pilaster, hollow fireproof tile wall (with pilaster both sides), double fireproof tile wall (with pilaster both sides—air space in center), brick wall (with hollow tile and cement mortar), hollow-brick wall (with brick furring, plastered on one side), concrete wall with sandstone facing, brick wall with sandstone facing, sandstone wall, sandstone wall (with 2-in. terra-cotta or wood furring and plaster), limestone wall and limestone wall (with 2-in. terra-cotta or wood furring or plaster).*

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For ordinary well-built house add 10%
For fairly good construction add 20%
For poor construction 30%

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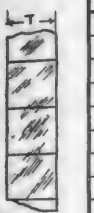
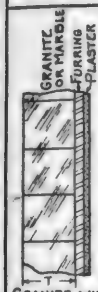
WALLS



GRANITE OR MARBLE

THICKNESS T	USED BY U. OF PA. A	THOMPSON ONE WALL EXP. He	THOMPSON TWO WALLS EXP. Hs	GREENE -	IRWIN	NAT. DIST. HEATING ASSO B	HUBBARD F	AMERICAN RADIATOR CO. T
8"								
12"	.48	.480	.402	54	45			.440
18"	.40	.408	.348	45	38		.34	.360
21"	.37	.378	.330		35		.29	.307
24"	.34	.354	.312	39	32		.27	.263
27"	.32	.336	.294				.24	.240
30"	.30	.318	.278	34				
33"	.28	.300	.264				.21	.214
36"	.27	.282	.252	30				.200
40"	.26	.264	.240					
48"	.24			24				

Given as Solid Stone — Given as Solid Stone — Stone = Brick + 33⅓%



GRANITE OR MARBLE FURRING PLASTER

GRANITE WITH 2" TERRA COTTA OR WOOD FURRING AND PLASTER

THICKNESS T	USED BY U. OF PA. A	He	Hs	II		RR		
8"								
12"	.40	.400	.335	28		40		
18"	.34	.340	.290	25		.34	.272	
21"	.32	.315	.275			32	.232	
24"	.30	.295	.260	23		30	.216	
27"	.28	.280	.245			28	.192	
30"	.27	.265	.232	21		27		
33"	.25	.250	.220			25	.168	
36"	.24	.235	.210	19		.24		
40"	.22	.220	.200			.22	80% of Unfurred Wall	
48"				17				

He GRANITE WALL, FURRED AND PLASTERED + 20%
II - GIVEN AS MASONRY
E - CARPENTER GIVES STONE SAME AS BRICK

WALLS

GRANITE OR MARBLE PLASTERED ONLY

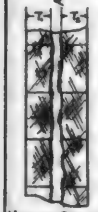
THICKNESS T = T1 + T2	USED BY U. OF PA. A	THOMPSON 1 WALL EXPOSED He	THOMPSON 2 WALLS EXPOSED He
12"	.46	.460	.385
18"	.38	.391	.334
21"	.36	.362	.316
24"	.33	.339	.299
27"	.31	.322	.282
30"	.29	.305	.267
33"	.27	.288	.253
36"	.26	.270	.242
40"	.25	.253	.230
48"	.23		

HOLLOW GRANITE OR MARBLE PLASTERED ONLY

	AA	HHe	HHs
12"	.35	.351	.282
18"	.31	.311	.247
21"	.29	.293	.232
24"	.28	.276	.219
27"	.26	.262	.207
30"	.25	.251	.198
33"	.24	.239	.189
36"	.23	.230	.181
40"	.22	.219	.171

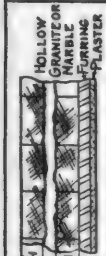
He - FURRED & PLASTERED GRANITE + 15%
HHe - FURRED & PLASTERED HOLLOW GRANITE + 15%.

WALLS



HOLLOW GRANITE OR MARBLE
T = T1 + T2

THICKNESS T = T1 + T2	USED BY U. OF PA. A	THOMPSON ONE WALL EXP. He	THOMPSON TWO WALLS EXP. Hs	NAT. DIST. HEAT. ASSO. R	HUBBARD F	PEGLET (CARPENTER) P
8"						.30
12"	.37	.366	.294			.25
18"	.33	.324	.258		.289	.19
21"	.31	.306	.242		.246	.18
24"	.29	.288	.228		.229	.17
27"	.28	.274	.216		.204	.15
30"	.26	.262	.206		.179	
33"	.25	.250	.197			.13
36"	.24	.240	.188			.12
40"	.23	.228	.178		85% of Plain Wall	.10
						.21



HOLLOW GRANITE OR MARBLE FURRING PLASTER

HOLLOW GRANITE OR MARBLE WITH 2" TERRA COTTA OR WOOD FURRING AND PLASTER
T = T1 + T2

THICKNESS T = T1 + T2	USED BY U. OF PA. A	He	Hs				
8"							
12"	.30	.305	.245	30			
18"	.25	.270	.215	.21	.231		
21"	.23	.255	.202	20	.197		
24"	.22	.240	.190	.19	.184		
27"	.21	.228	.180	.18	.163		
30"	.20	.218	.172	.17	.143		
33"	.19	.208	.164	.16			
36"	.18	.200	.157	.16			
40"	.17	.190	.149	.15			

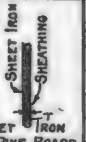
Given as Brick or Stone with Air Space — 80% of Unfurred Hollow Wall

He HOLLOW GRANITE, FURRED AND PLASTERED + 20%
OR MARBLE, " " " + 20%

WALLS

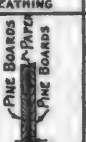
REINFORCED CONCRETE

THICKNESS T	USED BY U. OF PA. A	BUFFALO FORGE CO. L	HUBBARD F	AMERICAN RAD. CO. (BRICK + 20%) T	BUSEY C
4"	.90		.80	.816	
8"	.63		.55	.552	
12"	.48		.40	.396	
16"	.41			.324	
20"	.35			.276	
24"	.31			.240	
28"	.28			.216	
32"	.26			.192	
36"	.24			.180	



SHEET IRON ON PINE BOARD SHEATHING

½"	.50	.50			.50	
1"	.40	.40			.40	
1½"	.33	.33			.33	
2"	.28	.28			.28	
2½"	.25	.25			.25	



PAPER BETWEEN PINE BOARDS

½"	.32	.32			.32
1"	.24	.24			.24
1½"	.19	.19			.19
2"	.16	.16			.16
2½"	.14	.14			.14

L - WHEN FURRED & PLASTERED TAKE 80% OF SOLID WALLS
- WHEN HOLLOW, UNPLASTERED TAKE 85% " " "

WALLS

PLAIN CONCRETE

THICKNESS T	USED BY U. OF PA A	AUSTRIAN GOV. (MACON) G	THOMPSON Hk	THOMPSON He	BUFFALO FORGE Co. BRICK + 20% L	HUBBARD F	HARRISON M		AMERICAN RAD. Co. BRICK + 50%	H&V MAGAZINE 1917 — K	GREENE I	DONNELLY X	IRWIN N	BUSEY C			
2"			.87[A]										.85				
4"	.90		.69[A]		.624		.56		1.020	1.07		1.07	.785				
6"	.77		.59[A]							0.70		.714	.56				
8"	.63	.49	.49		.444	.66	.41		.690	0.51		.527	.49	.463			
10"	.56		.44[A]										.42				
12"	.48	.43	.54[A]	.540	.348	.48	.31		.495	0.43	.48	.357	.37	.363			
16"	.41	.37	.37	.468		.39			.405	0.36		.257		.313			
18"	.38				.300						.38						
20"	.35	.33	.33	.420	.264				.345					.275			
24"	.31	.30	.30	.372					.300		.31						
28"	.28	.27	.27	.336	.228				.270								
30"	.27										.27						
32"	.26	.25	.25	.312					.240								
36"	.24	.23	.23	.288					.225		.24						
40"	.22	.22		.264							.19						

CONCRETE PLASTERED ONE SIDE

	AA			HHe	JJ				GIVEN AS BRICK + 50%	WW				UU			
4"	.82				.600												
8"	.59				.432									.450			
12"	.46			.518	.336					.45				.350			
16"	.39			.419	.288					.39				.300			
20"	.33			.403	.252					.35				.263			
24"	.29			.357						.31							
28"	.27			.322	.216					.28							
32"	.25			.299						.26							
36"	.23			.276													
40"	.21			.253													

DOES NOT STATE WHETHER PLASTERED OR NOT. PROBABLY PLASTERED.

SANDSTONE FACING

CONCRETE WITH AIR SPACE

BRICK + 25%

He — FURRED AND PLASTERED CONCRETE +20%
HHe — " " " " +15%
Hw { ASCRIBED BY MACON TO REITSCHEL AND FOR ORDINARY CONSTRUCTION HAVE BEEN INCREASED 25%. (ABOVE FIGURES HAVE BEEN INCREASED)

WALLS

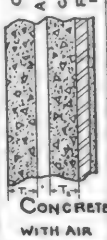
CONCRETE WITH 2" TERRA COTTA OR WOOD FURRING AND PLASTER

DOUBLE CONCRETE WALL WITH AIR SPACE
T = T₁ + T₂

THICKNESS T = T₁ + T₂	USED BY U. OF PA. A	THOMPSON He	GREENE I	BUSEY C	NAT. DIST. HEAT. ASSO. R	AUSTRIAN GOV. (MACON) G	HUBBARD F	BUFFALO FORGE L
8"	.63			.29			.528	.276
12"	.40	.45	.26	.25	.47		.384	.240
16"	.34	.39			.41		.312	
18"	.31		.24	.23				.216
20"	.29	.35		.20	.37		60% OF PLAIN CONCRETE	.192
24"	.26	.31	.21		.33			BRICK + 20%
28"	.24	.28			.30			
30"	.23		.19					
32"	.22	.26						
33"	.22				.28			
36"	.20	.24	.17		.26			
40"	.18	.22			.24			
44"	.17				.20			
48"	.16		.15					
4"	.72							.336
8"	.48					.30	.561	.300
12"	.37					.28	.408	.252
16"	.33					.26	.331	.228
20"	.29					.24	85% OF PLAIN CONCRETE	.192
24"	.26					.22		
28"	.24					.20		.168
32"	.22					.19		
36"	.20					.18		
40"	.18					.17		

COLD NOT STATE WHETHER PLASTERED OR NOT PROBABLY PLASTERED.

WALLS



CONCRETE WITH AIR SPACE, FURRED & PLASTERED
T = T₁ + T₂

THICKNESS T	USED AT U. OF PA.	BUSEY C	HUBBARD F
8"	.38	.313	.449
12"	.30	.263	.326
16"	.25	.238	.265
20"	.20	.200	
24"	.19		
28"	.18		
32"	.18		
36"	.17		

80% VALUE FOR UNFURRED HOLLOW WALL

WOODEN WALLS

Thickness T	Used by U. of Pa. A	German Gov. (Wolff) B	E. Peclet Carpenter	Austrian Gov. (Macon) G	Greene 1913 I	C. Buffalo Forge Co.	K Snow			R Nat. Dist. Heating Assn	T American Rad. Co.	C Busey	Recknagel & Rietschel Pine Inner C	Recknagel & Rietschel Pine Outer C	Recknagel & Rietschel Oak Inner C	Recknagel & Rietschel Oak Outer C	Harding P	N Irwin
1/8	.86			.56						.56								.29
1/2	.78			.52		.77				.52		.77	.52	.56	.64	.70		
3/4	.69			.44	.27 .55					.44			.44	.47	.59	.63		
1	.59	.41	Given as double wood not acceptable to Wooden Bldgs. Associations	.41	.24 .48	.51				.41		.51	.39	.41	.54	.58	.547	
1 1/2	.51				.21 .40	.43	.30					.43	.31	.32	.47	.50	.370	
2	.43				.34	.35	.257			.28		.35	.26	.27	.41	.43		
2 1/2	.39					.30	.228					.30	.22	.23	.37	.39	.279	
3	.36						.20						.19	.20	.33	.35		
3 1/2	.32																	
4	.29		.120															.24
8	.17		.065															.46
12	.13		.045															
16	.10		.033															
18	.09		.031															
20	.08		.030															
24	.07		.029															
28	.06		.027															
32	.05		.025															
36	.05		.020															
40	.04		.018															
1 1/4"	.55												1/8" .34	1/8" .36	1/8" .50	1/8" .54		

Given As Pine Boards — Given As Pine Boards — Given As Pine Boards — Given As Pine Boards

Given As Double Wood Partitions Both Sides — Given As Solid Wood Partition

Wood Wall. Thickness not given

Frame House Construction. Thickness not given

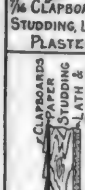
Both values for factory bldgs. Thickness not given

FRAME WALLS

7/8" Clapboards, Studding, Lath & Plaster.

Thickness	Used by U. of Pa. A	D Kineally	Thompson Ha	Buffalo Forge Co. J	F Hubbard	N Allen	O Hoffman	P Harding	Q Tweed	R Nat. Dist Heating Assn.	- Greene 1913	H & V Magazine 1917 —	x Donnelly	Z Irwin
	.45	44	44	44	.30	.1	.25 to .30	47	.25	45		.44	.471	.29
Without L. & P.	.48											.47		Frame House Construction
Factory Bldgs.														.24 to .46
Factory Bldgs.														

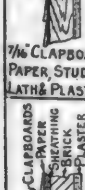
7/8" Clapboards, Studding, Lath & Plaster.



	AA	DD	HHa	JJ	LL	NN	OO	PP	QQ	RR	II	WW	XX
	.31	.31	.31	.31	30	.1	.25 to .30	.34		.31		.31	.343
Without L. & P.	.34											.34	

For walls of the average wood dwelling — For ordinary wood house construction — For walls of the average wood dwelling

7/8" Clapboards, Paper, Studding, Lath & Plaster.

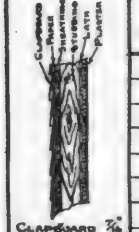


	AAA	LLL	NNN	OOO	PPP	QQQ	III	WWW
	.30	30	.1	.25 to .30	.21	.25	.20	
								.22

Clapboards, brick lined & plastered

7/8" Clapboards, Paper Sheathing, Brick & Plaster

FRAME WALLS



CLAPBOARD ⅞" PAPER, SHEATHING ⅞" STUDDING, PLASTER & LATH.

	THICKNESS	USED BY U. OF PA. A	O KINEALY	I THOMPSON	— GREENE 1913	L BUFFALO FORGE CO.	K SNOW	L HUBBARD	N ALLEN	O HOFFMAN	P HARDING	B NAT. DIST. HEATING ASSN	AMERICAN RAD. CO. T	H&V MAGAZINE 1917—	X DONNELLY
		.24	.23	.23	.20	.23	.228	.30	.1	25-30	.20	.24		.23	.257
								FOR WALLS OF THE AVERAGE WOOD DWELLING	FOR ORDINARY WOOD HOUSE CONSTRUCTION	FOR WALLS OF THE AVERAGE WOOD DWELLING	GIVEN AS WOODEN WALL OR FLOOR				
		AA	DD	HH₀	II	JJ	KK	LL	NN	OO	PP	RR	TT	WW	XX
		.29	.28	.28		.28	.286	.30	.1	25-30	.30	.29	.280	.27	.30

CLAPBOARD ⅞" SHEATHING ¾" LIME STUDDING & PLASTER

	WITHOUT L & P.													.30	

		AAA			III							RRR		WWW	
		.29			.31							.27		.26	

WALLS

	THICKNESS T	USED BY U. OF PA. A	PRUSSIAN GOV. RECKNAGEL V	O KINEALY	— GREENE	L HUBBARD	O HOFFMAN	Q TWEED	B NAT. DIST. HEATING ASSN	H&V MAGAZINE 1917—	HAUSS Y GER. PRACTICE	AUSTRIAN GOV. (MACON) G	X DONNELLY
		.10			.08			.10					
		AA	VV			LL	OO	QQ	RR	WW	YY	GG	
	1.6"	.61	.615								.60	12" .62	
	2.0"	.52	.492								.48	2" .59	
	2"	.60				.60	.60	.60	.60	WIRE LATH, CEMENT & PLASTER		21" .56	
	3"	.50				.50	.50	.50	.50			3" .53	
												31" .50	
	1½-2½	.61								.61		4" .47	
	3"-3½	50								.49			

		AAA							RRR				XXX		
		.21							21				.214		

WALLS

ORDINARY STUD PARTITION PLASTER BOTH SIDES.

THICKNESS T	A USED AT U OF PA	O KINEALY	N THOMPSON No	- GREENE 1913	J BUFFALO FORGE CO.	X SNOW	O HOFFMAN	Q TWEED	R NAT. DIST. HEAT. ASSO.	K H.&V. MAGAZINE 1917	X DONNELLY
	.34	.34	.34	.36	.34	.143	.34	.34	.34	.34	.30

4" STUDS

GIVEN AT PARTITION BETWEEN HEATED AND UNHEATED ROOM.

ORDINARY STUD PARTITION PLASTER ON ONE SIDE.

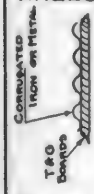
	AA	DD	HHo	II	JJ	KK	OO	QQ	RR	WW	XX
	.62	.60	.60	.49	.60	.257	.6	.49	.54	.60	.60

4" STUDS

DOUBLE 1" BOARD WITH SAWDUST BETWEEN.

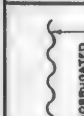
SAW DUST	AAA	JJJ
2"	.13	.127
4"	.09	.083
6"	.06	.062
8"	.05	.049

WALLS



CORRUGATED IRON OR METAL LINED WITH T & G BOARDS

THICKNESS	A USED AT U. OF PA.	H THOMPSON	J BUFFALO FORGE CO.	L HUBBARD	T AMERICAN RAD. CO.	K H.&V. MAGAZINE 1917	C BUSEY
		.17					
M"	.45		.45				.45
1"	.36		.36				.36
1½"	.30		.30				.30
2"	.26		.26				.26
2½"	.23		.23				.23



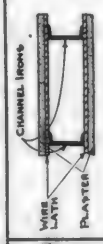
UNLINED CORRUGATED IRON OR METAL

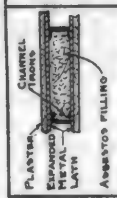
	AA	HH1	JJ	LL	TT	WW
	1.50	.84	1.50	1.20	.840	.84

SHEET IRON SIDING UNLINED

	AAA	JJJ
	1.20	1.20

WALLS





THICKNESS	A USED AT U. OF PA.	- GREENE 1913	Q TWEED	R NAT. DIST. HEAT. ASSO.
	.34	.34		.34

	AA	II	QQ	RR
	.21	.21	.21	.21

	AAA

CHICAGO COMMISSION ON VENTILATION

A VENTILATION PARADOX

The Use of Air From Chicago's Freight Tunnel as a Refrigerating Agent and Fuel Conserver.

By THOMAS R. WILSON,
Ventilation Engineer, Chicago Health Department.

(Concluded from October issue.)

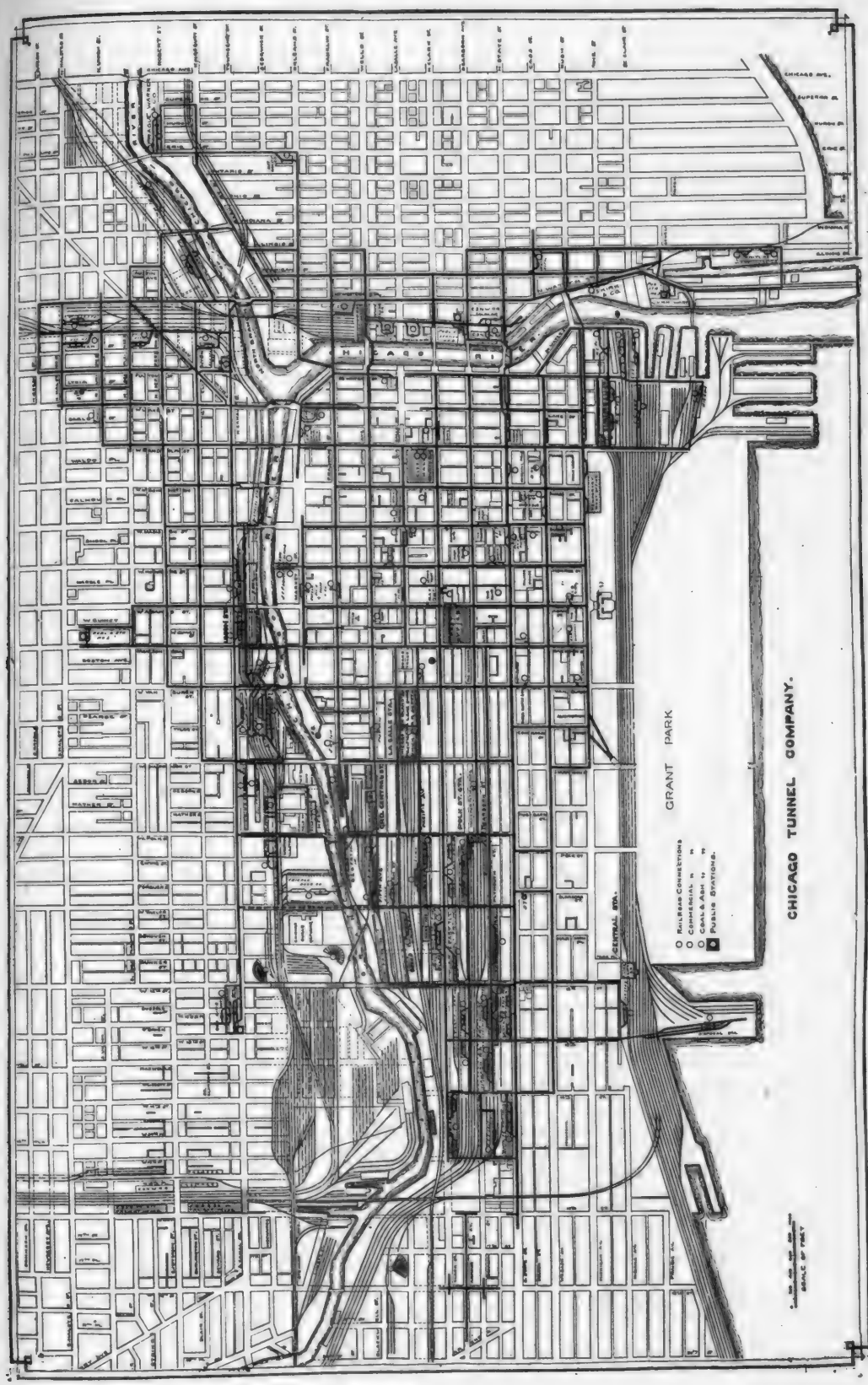
POSSIBILITIES IN USE OF TUNNEL AIR FOR COOLING PURPOSES.

The writer believes the first to recognize the dormant possibilities in the use of tunnel air for cooling purposes was the proprietor of a large cafeteria located in the basement of one of our commercial buildings. The restaurant in question has a 36-in. direct-connected disc fan drawing air through a 36-in. connection from the tunnel crown. The air is delivered by the fan into a plenum space between the street retaining wall and the metal lath and plaster wall of the restaurant. This plenum space extends along two sides of the dining-room. The supply registers are located near the ceiling line in these walls. The intake is so arranged that if the restaurant becomes too cold the tunnel air may be tempered by a judicious admixture with air from out-of-doors.

TEMPERATURE DIFFERENCE MAY BECOME TOO GREAT FOR COMFORT.

The proprietor states that the adoption of the cooling system changed the restaurant from a losing proposition to a comfortable money-making eating place. He asserts further that the equipment will maintain a 65° temperature in the dining room when the temperature outside is 95°. It is the writer's opinion, however, that this difference is too great to be compatible with comfort. A temperature ranging about 75° when the outside temperature is 85°, or 85° when the outside temperature is 105°, is a sufficient contrast for comfort and still does not give the impression of chill that a 30° difference would produce, especially during the first 15 or 20 minutes after entering the room. In other words, with too great a temperature difference the delicate mechanism which regulates heat transmission from the body is suddenly burdened by the additional work of adjusting itself to a new, highly-contrasted condition, subjecting the person possibly to an even greater degree of discomfort than would be experienced from excessive heat.

During the summer months of 1916 this subject attracted the attention of some of the larger theatre owners in the city. Theatre patrons object to sitting through a performance on a hot night with a temperature of 90° and a high relative humidity in the auditorium, consequently the theatre business is a losing proposition during the summer months and many amusement houses are closed for this reason. The expense of installing a refrigerating equipment is frequently out of proportion to the benefits derived when we consider the comparatively short duration of the hot season. If tunnel air at practically no expense could be used for cooling these theatres it would be a



MAP OF CHICAGO'S FREIGHT TUNNEL SYSTEM.

happy solution of the problem. The question at once arose whether this was reasonable and whether or not the tunnel air was detrimental to health or objectionable on account of odors or for any other reasons. The Ventilation Division was, therefore, requested to make an investigation of this matter and to decide whether or not the tunnel air could be used for this purpose. Air tests were made in the tunnel itself at three different locations, the results of which were as follows:

CO_2—3.5—3.5—4.0—3.5—3.2—3.2—3.4

Bacteria—2—7—14—3—6 colonies, 2-minute plate

Dry Bulb—53—53—52° F.

Wet Bulb—45—46—45° F.

Dust—10,600—14,000—12,000—9,600

These tests, in connection with the others previously reported, and with the careful inspection of conditions in the tunnel justify the following conclusions:

1st—Tunnel Sanitation: The tunnel is maintained in accordance with the best sanitary requirements. The company enforce reasonable sanitary rules and regulations most rigidly. The numerous shafts and building connections provide suitable egress to toilet facilities. During the numerous inspections made in the tunnel, no insanitary conditions were observed.

2d—Dust: Numerous samples of the air have been taken to determine the dust content. The highest count obtained was 15,000 particles per cubic foot. This was during cold weather when the moisture content of the air was at its lowest point, (53° dry—45° wet). Furthermore, these samples were taken under most adverse conditions, several trains having just passed previous to the collection of the samples.

3rd—Bacteria: Of the numerous culture plates exposed the highest colony count was 14. This was taken at the time of the dust sample, just after trains had passed the observing station. Many plates were exposed which developed no colonies. The average for all plates was 2. These plates show a very low bacterial content when compared with others exposed in the open air.

4th—Odors: The percentage of odors was always low and typical of tunnel air. They disappeared almost entirely after heating some 20° or 30°.

5th—CO_2: Of the samples of air analyzed the CO_2 gave a content of 3.5 or less, with one exception. The exception was taken at a point where contamination was possible from a boiler-room connection. The analysis of this sample was 4.5.

6th—Temperature—Dry-Bulb: The dry-bulb temperature ranges from 47° in cold weather to 57° during the summer months.

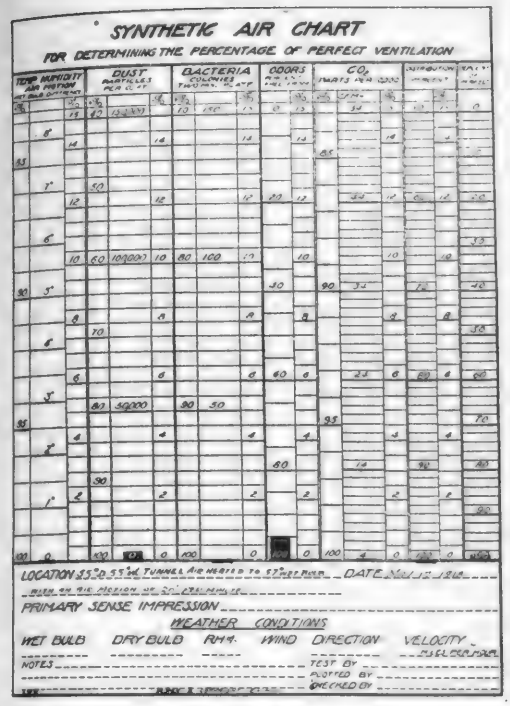
7th—Temperature—Wet-Bulb: The wet-bulb readings range from 57° in the summer or a total saturation to a maximum depression of 8° in cold weather. The extent of the depression is determined almost entirely by the moisture content of the outside air.

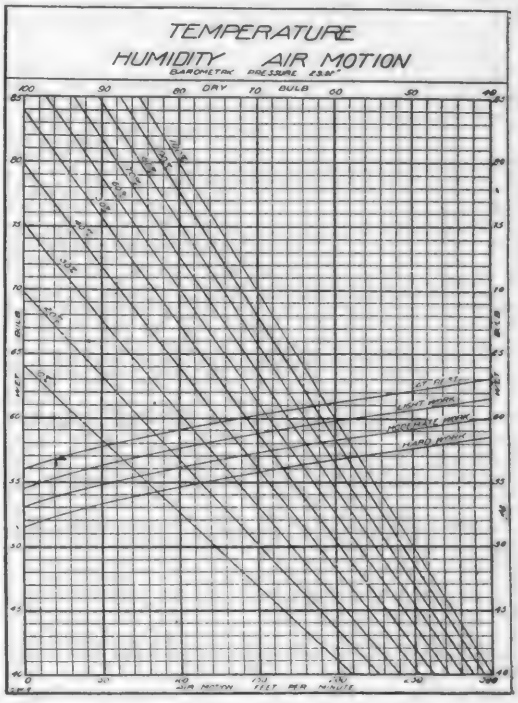
TUNNEL AIR TEST RESULTS SHOWN ON SYNTHETIC AIR CHARTS.

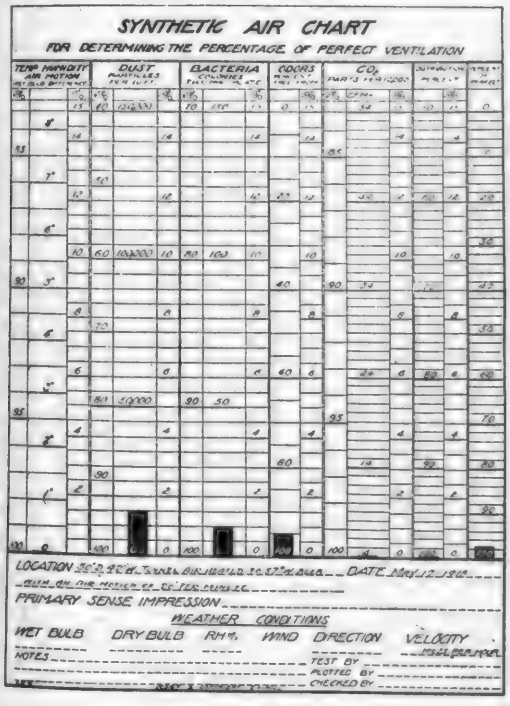
The average results of these tests are computed on the synthetic air charts shown herewith. The results are calulated on warming the tunnel air to a wet-bulb of 57°, which is the desirable wet-bulb for an air motion of 20 ft. per minute. As the wet-bulb temperature of the tunnel is always lower than this point, it is essential that some heat be added to bring the air to the desirable temperature necessary for comfort. It is only necessary to add a small amount of heat to raise this air to the comfortable wetbulb temperature.

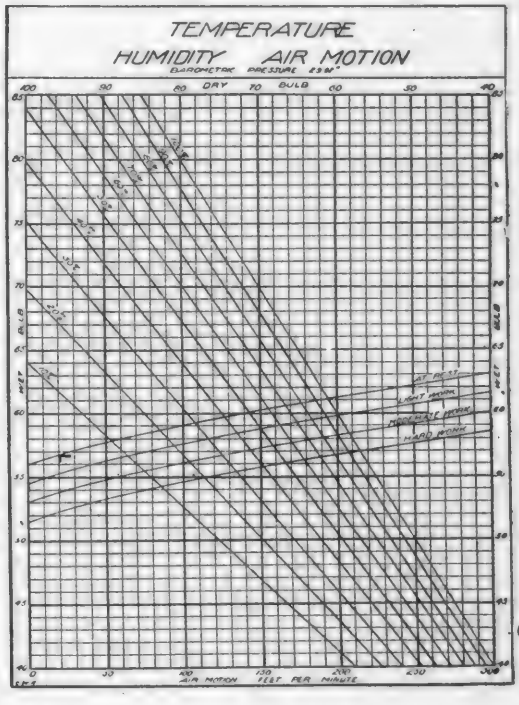
Studying the foregoing test and the summary of the same it is reasonable to conclude that the air from the tunnel can be used with safety for the purposes desired. It has a lower dust, bacterial and CO_2 content than the air from above ground, contains more moisture and is free from objectionable odors when warmed to the temperature necessary for comfort.

During a tour of inspection through









RESULTS OF TESTS OF TUNNEL AIR SHOWING ITS ADAPTABILITY FOR USE IN COOLING THEATRES.

the tunnel many employees were questioned by the Commissioner of Health regarding their health and the prevalence of disease among their fellow workmen. Their answers were uniformly favorable and their general appearance and physical condition were certainly above the average of indoor workers above ground.

CALCULATION OF ADVANTAGES SECURED IN USING TUNNEL AIR FOR THEATRE VENTILATION.

The reader is willing to allow that the test and investigation previously referred to show in results that the tunnel air is equal, in purity, if not better than the outside air. Then the question arises what are the benefits to be derived from the use of tunnel air for ventilation purposes during the winter and summer months? Let us take, as a concrete illustration, a theatre 150 ft. long, 100 ft. wide and 50 ft. high, seating 1,000 people, the walls and roof having an average heat transmission coefficient of 0.5 B. T. U. per square foot per degree difference per hour, with a 95° temperature outdoors and maintaining an 80° temperature inside. A temperature of 80° is selected because of the sufficiency in temperature contrast, the reasons for which are explained in an earlier part of this article. Our problem is to determine the volume of 55° air necessary to maintain an 80° temperature in the theatre.

We have to contend with three factors which would tend to operate against this 15° drop from outdoor temperature:

1.—Heat infiltration through the walls and roof.

2.—Heat generated by the occupants.

3.—Miscellaneous sources of heat, such as from lights, motors, etc.

This theatre has a total exposed area, including walls and roof, of 4,000 sq. ft. of surface. This exposed surface times our heat transmission coefficient factor of 0.5 would permit 20,000 B. T. U. heat infiltration per degree difference in temperature per hour, and with a 15° drop in temperature this amount of heat infiltration would equal 300,000 B. T. U. per hour. Next to consider would be the heat given off by the occupants. Various authorities give 400 B. T. U. per hour per person as an average heat loss and this heat loss, multiplied by 1,000 occupants, would equal 400,000 B. T. U. per hour. Estimating 50,000 B. T. U. per hour from the miscellaneous sources of heat we have a total of 750,000 B. T. U. per hour which we must offset with a certain volume of cool air sufficient to maintain a final temperature of 80°. From our formula, C. F. M. times weight of air, times specific heat, times temperature difference, times minutes, we have the equation:

$$\text{C. F. M.} = \frac{750{,}000}{0.074 \times 0.241 \times 60 \times 25} = 26{,}800 \text{ C. F. M.}$$

which is the volume of entering air at 55° necessary to maintain an 80° temperature in the theatre.

The foregoing example, together with the results previously given of the analyses and tests of air purity and properties, give determinations that in the initial cost of construction, renewals and repairs, purity of air supply, relative freedom from dust and bacteria, improvement in humidity conditions, and in the fact that restaurant odors, smoke or any of the allied nuisances cannot enter the intake, should make this method of summer ventilation a very desirable one for those who are in need of and in locations to avail themselves of this unique method of achieving the desired result.

COMPARATIVE FIGURES, USING OUTSIDE AIR.

Let us consider what would have happened had the same volume of outside air been used in this theatre for ventilation. We would have had to start with a 95° temperature in the building and to this would be added a

certain temperature rise, which we will determine, this addition being due to the 400,000 B. T. U. per hour given off by the occupants and to the 50,000 B. T. U. given off by the miscellaneous sources of heat, equalling 450,000 B. T. U. per hour which would have to be dispersed. This would be accomplished in two ways, first by heat loss through the wall, and second by warming the air to some certain temperature above 95°.

Our problem now is to be determine the temperature in the theatre under these conditions, that is, to find out the temperature rise above 95° at which the heat necessary to raise the air temperature and the heat loss through the walls will utilize our available 450,000 B.T.U. per hour or 7,500 B. T. U. per minute. With our formula we find that 26,800 C. F. M. x 0.241 x 0.074 x 1° = 480 B. T. U. are required per minute to raise 26,800 C. F. M. 1°. Our heat loss through the wall per degree difference per minute is

$$\frac{40{,}000 \text{ sq. ft.} \times 0.5}{60} = 333 \text{ B. T. U.},$$

so that with each one degree rise in temperature, with this volume of air, we will utilize 813 B. T. U. per minute. 813 B. T. U. per minute is the sum of our wall losses and heat necessary to raise 26,800 C. F. M. 1°, and as we have 7,500 B. T. U. per minute available in heat generated in the building it is apparent that

$$\frac{7{,}500 \text{ B. T. U.}}{813}$$

will give the required temperature rise necessary to utilize the heat generated in the building, or 9¼°. This is 9¼°, plus our original temperature of 95° gives a resultant temperature of 104¼°, quite a contrast from our final temperature of 80° obtained by the use of the tunnel air.

SAVING IN FUEL WITH TUNNEL AIR.

With the use of tunnel air in winter a further benefit is to be derived, namely the saving in fuel, and with the adverse conditions which made the coal problem last winter one of public concern it is not to be wondered at that those who are using this air for heating are enabled to cut their coal bills to an appreciable extent.

In Chicago the average temperature for the heating season is 31° F., so it may be easily determined that by the use of this 50° tunnel air in comparison with our 31° outdoor air just what fuel saving would be effected. In using outside air for tempering to 70° we must supply sufficient heat to raise the temperature 39°, while with the use of tunnel air we require a sufficient amount of heat to raise the temperature only 20°. This saving in heat amounts to 19/39 or about 49%. In blast heating a saving is accomplished but to a less extent, due to the final temperature being 100° instead of 70°. The saving in coal with this method of heating amounts to 19/69 or about 27½%. In the foregoing calculations the moisture content has been neglected.

The fuel-saving factor in using tunnel air in cold weather; the marked cooling effect in warm weather, together with its non-injurious properties, as found by test and proven by the physical condition of the tunnel employees, make it deserving of the recognition which it is now receiving. To the writer's knowledge there are at the present time three theatres, two restaurants and a number of boiler- and engine-rooms using this air for ventilation purposes. Several other theatres have this project under consideration and it is possible that this number will be increased in the near future. It may well be said that in using tunnel air for ventilation purposes we are making a saving instead of burning at both ends of the candle.

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"THERE must have been something wrong with our copy in your last issue," writes one of our advertisers, "as we received only two inquiries." We have no hesitation in publishing this comment because it brings up a question of what really happens when publicity is given through the columns of an engineering journal to a manufacturer's product. In this particular case the device in question is comparatively new. Its application is a distinct departure from the usual practice. What, then, may the manufacturer of such a device expect from an initial campaign of publicity?

We know that the average man reads the advertising, as well as the reading pages, of his magazine. He sees the familiar names of the various manufacturers in his field and his attention, no doubt, is arrested here and there by some announcement of a new development or a change of model in familiar types of apparatus. Presently he comes upon the announcement of something entirely new and distinct. The chances are he will stop here and read what the announcement says. What is his attitude of mind as he does this? Is there not usually a note of skepticism as to whether the device will successfully fulfill the claims made for it? We are speaking now of the average reader. Does he not say to himself, "Another new wrinkle. Well, what's the matter with the way we have always been doing it?" Or else, he may admit to himself that the method looks feasible. Some day, he thinks, he will try it out but not until he has seen it in operation or has heard from others what it will do.

Does this mean that the publicity given the device has been in vain? We think not. The repetition of the announcement again catches his eye. If the manufacturer is wise he will present before long some figures showing actual performance or refer to some typical installations that have been successful. Finally our average reader decides that he wants to keep up with the latest developments and writes in for data or a catalogue. The rest depends upon the merits of the device itself.

We do not think the foregoing is peculiar to the heating trade, by any means. The heating trade has often been accused of being a close corporation in which the newcomer finds it a hard matter to drive an opening wedge. This, however, is human nature. Why should engineers be in a hurry to take up with each new device as it appears when they know those they are using are reliable, at least?

The function of the trade journal is to bring the new developments to their attention, the function of the advertiser, as we take it, is to keep attention focussed on his product irrespective of the number of inquiries he receives. This done, the function of the reader will take care of itself, for no desirable customer is going to deprive himself for long of the advantages of a really useful improvement that can be applied in his practice.

NO QUARREL NECESSARY BETWEEN NATURAL AND MECHANICAL VENTILATION ADVOCATES

Clear and Well-Defined Field for Each Method Depending Upon Required Air Conditions with Given Type of Occupancy and Occupation.

A timely contribution to the discussion of open-window versus mechanical ventilation is made by Dr. E. Vernon Hill, head of the Division of Ventilation of the Chicago Department of Health. It seems that an article was published recently in "The Ways of Health" Department of the *Chicago Daily News* entitled "Open Windows vs. Fans," to which Dr. Hill made a vigorous reply, the principal portions of which are given herewith:

"Many persons, social workers, physicians, and I am sorry to say, public officials, enjoy declaiming about ventilation, the open window, God's fresh air, etc., laying undue emphasis upon the methods employed to ventilate a room with little or no thought as to the actual conditions maintained therein. They usually proclaim the virtue of natural methods as against the artificial or mechanical.

"We must admit, however, that these misinformed michief-making enthusiasts for fresh air are not the only ones at fault. Strong partisanship is also exhibited on the other side of the fence. Heating and ventilating contractors, and, to a less extent, manufacturers of equipment, are not slow to defend mechanical ventilation. Their defense unfortunately is not always confined to the well-designed and efficiently-operated equipment but takes in everything that goes by the name of a mechancal equipment. Many of them would advocate permanently closing the numerous windows of the cathedral of St. Peter in Rome and installing some ducts, a fan and a stack of Vento, confident that in this manner they would improve air conditions in this historic edifice. This is all entirely wrong. It is not only unscientific but tends to block progress in one of the most important fields of preventive medicine.

NATURAL VENTILATION LIKENED TO INDIVIDUAL WATER SUPPLY.

"There is no quarrel between natural and mechanical ventilation any more than there is between natural and a mechanical water supply for the City of Chicago. There was a time when a man could go out into his backyard and dig a well and get a pure and abundant supply of clean water for his household use. That time has long since passed in large cities, and we must now have recourse to a mechanical water supply. In some cases we must go further than this, we must filter it, chlorinate it or otherwise treat it to make it pure and wholesome, and anyone who is so ill-advised as to condemn the latter method and to recommend going back to the old well in the yard would be the laughing stock of the community.

"The situation is parallel with that of our ventilation problem. There are many places and conditions, in rural districts particularly, where natural ventilation meets all the requirements and where it is folly to install fans or other mechanical devices. There are some rooms, even class-rooms, where the space per occupant is ample; where the window area is adequate; where the outside air is uncontaminated and where noise on the outside of the building is not excessive in which window ventilation is entirely satisfactory. There are many other locations, however, at the present time, and the conditions producing them are unfortunately increasing, where natural ventilation is entirely out of the question and where we must, therefore, have recourse to mechanical methods, not from choice but from necessity.

"Saxon Snell, the well-known English authority, in speaking of the ventilation of churches hits the nail squarely on the head when he says 'I do not say that mechanical ventilation is not necessary and desirable in many instances, but I do say that no church should be constructed that requires it.' This is true not only of churches but of a considerable number of other buildings. Factories, where the process carried on does not contaminate the air; where the space per occupant is 1000 cu. ft. or more, and where the windows are situated on four sides of the room, which is undivided by partitions, do not require mechanical ventilation. This has been amply proven by the tests conducted by the Chicago Commission on Ventilation in the Paris Garter Factory and other similar buildings in the city. Offices with somewhat less space per occupant and practically the same ratio of window area do

not require mechanical ventilation. In many buildings of this type, however, the space per occupant is insufficient or the necessary window area cannot be obtained. Again, the space may be divided by partitions that prevent air circulation. In this case, as in many others which we will not discuss at the present time, adequate ventilation by means of window becomes impossible and we must adopt mechanical means.

"Let us have done, therefore, with this foolish and unprofitable argument respecting the comparative values of mechanical vs. natural ventilation. Let us understand that each has its clear and well-defined field and that our problem is not to determine their relative value but rather to determine what air conditions are desirable in a given space with a given type of occupancy, occupation, etc., and then to decide from experience and from tests in similar buildings whether these conditions can be maintained without mechanical ventilation. If they can, let us by all means make use of natural methods; if they cannot, let us adopt whatever mechanical adjuncts are necessary to obtain the desired results.

"There is no mystery in the science of ventilation at the present time. The brilliant work of modern investigators has placed the subject on a logical, scientific basis, leaving little room for the timeworn prejudice or personal opinion. The factors that influence or control air conditions are fairly well understood. They are the temperature, humidity and air motion; the dust, bacteria and CO_2 content, and the degree of objectionable odors present. Air distribution also, although not strictly speaking a factor, should be given due consideration when we are dealing with air conditions in a confined, occupied space.

"It is possible to design a record card on which each of these factors is given its proper weight and importance as a part of the whole and to plot test results on this card from actual observation made in a given room. From this record we can now determine the percentage of perfect ventilation as shown by our test, and, what is of equal importance, we can see in what respect it is deficient. I enclose such a card for your information showing a test in a school classroom ventilated by windows only. I will say by way of explanation that with a complete, intelligently designed mechanical system we expect to obtain a percentage of not less than 95 in a class-room in winter weather with the windows closed. The test record submitted shows a percentage of 88. Equipped with this device, this ventilation measuring stick as it were, the investigator can compare results of different tests on a cold mathematical basis, necessarily excluding private opinion and prejudice.

"Many hundreds of tests of this kind in school class-rooms ventilated by windows and by mechanical systems, in theatres, factories, offices, workshops and other public, semi-public and private buildings have been made by the Ventilation Division of the Chicago Health Department since its organization in June, 1912. From the observations and experiences thus gained, and from an analysis of our records, certain conclusions are unavoidable. The following may be of interest:

CONCLUSION OF CHICAGO DIVISION OF VENTILATION.

"1.—Natural ventilation by means of windows is satisfactory in offices, light manufacturing industries, etc., where the work done or the process carried on does not materially contaminate the air, provided:

(a) A minimum of 900 to 1000 cu. ft. of space per occupant is available.
(b) Windows are provided on four sides of the space having an area from 10% to 12% of the floor area.
(c) Humidifying devices are installed that will maintain a wet-bulb temperature of not less than 57°.
(d) Thorough cleanliness with respect to the floors, furniture and general equipment is maintained.

"2.—Natural ventilation by means of windows is possible in school class-rooms, provided:

(a) The space per occupant is not less than 800 cu. ft.
(b) The window area must not be less than 12% of the floor area, windows on at least two opposite sides of the room.
(c) Artificial humidifying devices capable of maintaining a wet-bulb of 57° in cold weather, with air circulating fans to equally distribute the moisture and maintain a satisfactory air movement throughout the room.
(d) Oiled floors and scrupulous cleanliness must be observed.

"3.—Patent window ventilators, cloth screens and other similar devices for the vention of class-rooms should be unqualifiedly condemned. They give consideration only to one of seven factors that control air conditions in a room, namely, the introduction of outside air. To obtain an adequate air supply is the simplest part of the ventilation problem. To obtain the correct wet-bulb temperature; to get proper distribution of the

air; to maintain it practically free from dust and bacteria and objectionable odors, are the real difficulties in the ventilation of a class-room. These are ignored by those recommending patent ventilators and cloth-screens. The latter method obstructs the light and allows dust and bacteria to enter in considerable amounts; it has practically no redeeming feature. The children can be made just as miserable by shutting off the heat, with a marked saving in fuel, an important consideration at the present time.

"4.—Any mechanical ventilating equipment, if properly so-called, must consist of the following:

(a) Devices for introducing and distributing a variable amount of air according to varying conditions from 15 to 20 to perhaps 50 cu. ft. per pupil per minute. Distribution from one supply register in a room is a practical impossibility.

(b) The air should be controlled within a variation of less than 2° from a wet-bulb of 57°. Ordinary thermostatic control by a dry-bulb thermometer is wrong, as the dry-bulb temperature does not determine comfort.

(c) The air supply must be free from dust, bacteria, or other impurities. This means that an efficient air cleansing device must form a part of every ventilating equipment, no matter where the building is located.

(d) The entire mechanical equipment must be so constructed that every part of it from the building intake to the outlet registers in the room is readily accessible for thorough cleaning and repair. It is safe to say that less than 5% of the mechanical equipments installed in school buildings throughout the United States meet these requirements, and it is no wonder that teachers and others who are interested in this problem are not slow to criticize. A fan and heater, with a system of ducts, is not a ventilating equipment and should not be so designated. The latter is simply a device for blowing air into a room. With such a device the results obtained from its use are no better than bad ventilation by windows; frequently they are not as good.

"It is perfectly clear that the solution of our school ventilation problem does not lie in the return to the antiquated and inefficient so-called natural methods. To get the air space required for window ventilation would mean practically doubling the number of schools in the country. This is clearly out of the question and even if this were done it would be a difficult problem to obtain proper window area on opposite sides of the room. Neither is this question to be solved by the installation of the type of equipment just mentioned, which is usually designed by draftsmen, or salesmen; installed by tinsmiths, and operated by janitors. It lies rather in a better realization of what constitutes satisfactory air conditions and the insistence by those who are responsible for the installation of the same on the equipment being properly designed and installed and tested, when complete, to see that it will maintain the desirable standard.

"The tests in the New York schools reported by Dr. Josephine Baker may result in good or in harm, depending upon how carefully they are interpreted. Assuming that the results obtained are trustworthy, and we have no reason to think otherwise, the tests indicate that air conditions, from the standpoint of health at least, are better in the window-ventilated rooms than in those rooms ventilated by mechanical methods, and the results should awaken public school officials to their laxity and carelessness in the installation, and possibly in the operation, of these mechanical equipments. To conclude from the report that natural ventilation is to be preferred to mechanical would be a grave mistake and result in much harm. The entire matter emphasizes strongly the utter futility of making comparative tests of this kind. What we should do is to test the conditions in the rooms directly and to make comparisons, if desirable, of these tests.

"In conclusion, allow me to say that the common beliefs in so-called natural methods of this or that are oft times unwarranted. Natural methods are not the best. Nature is notoriously careless and inefficient. She creates with wasteful prodigality hundreds, yes thousands, of the lower forms of life that a few may live and fulfill their destinity. She ushers man on to the stage of life with a useless and troublesome vermiform appendix and many other vestigial remains of prehistoric ancestors to burden and clutter his anatomy. His natural skin covering is tender and soft, offering a woefully inadequate protection to the elements. But he is endowed with a brain, a truly wonderful organ, which he is expected to use for correcting and improving his condition. Each and every milestone that marks his road and measures his progress is an accomplishment or an invention in something artificial, something that makes him less dependent on nature and her various moods.

Civilization is artificial today almost in its

entirety. Our clothing, our food and water supply, the houses we live in are artificial developments and we must of necessity maintain and promote our artificial life with artificial methods and devices. The cry of 'Back to Nature' is the cry of the reactionary; of the man who acknowledges defeat.

"Having this truth clearly in mind let us do all that we can to encourage and promote the development of artificial or mechanical ventilation, as in this direction only lies true progress."

AUTOMATIC TEMPERATURE REGULATION AS A FUEL CONSERVATION MEASURE

Advance Report of a Committee on Automatic Heat Control, as Furnished to the Fuel Administration.

(For presentation at the annual meeting of The American Society of Heating and Ventilating Engineers, New York, January, 1919.)

There are many appliances on the market for securing automatic temperature regulation. There are a number of substantial and well-established firms having representatives in principal cities, who make a business of manufacturing and installing these devices. We may state, therefore, that automatic temperature regulation is a commercial success, and that the various methods of securing it are effective in the particular field for which each was designed.

All devices for automatic temperature regulation are and must be devices making for economy of fuel, since they shut off the heat supply whenever the desired temperature has been attained, turning the heat on again only when the temperature drops below the desired point.

TENDENCY TO OVERHEAT DURING MILD WEATHER.

The human mechanism can flourish within a very close temperature range only. It is necessary, therefore, during about two-thirds of every human life, for that life to be carried on either within artifically-heated spaces or within unusually heavy wearing apparel. The artificial heating apparatus must be sufficiently powerful to maintain a temperature of around 70° F. when the weather outside is at its coldest. Since such low outside temperatures exist for a comparatively small part of the heating season only (it is below zero in this latitude only about 10% of the heating season) it follows that during the balance of the heating season the heating apparatus must be operated at less than full capacity. There is thus a constant tendency to overheat during mild weather in all classes of buildings.

AUTOMATIC REGULATION OF BODY TEMPERATURE NECESSARY.

The results of overheating on human efficiency and health are profound, and within the comfort limits of our normal life, overheating is more common and carries more harmful results by far than underheating. Granting, for instance, that 70° at normal humidity is most comfortable, we deteriorate far more rapidly, mentally and physically when living in an average of 80° than when living in an average of 60° even though the higher temperature may be compensated for by lower humidity at the high temperature, and higher moisture content at the lower temperature. The elaborate mechanism for automatic temperature regulation in the bodies of mammals and the serious results of very slight failure of this regulation to function properly, should indicate the wisdom of all practicable exterior measures that we can take to assist.

In all buildings or enclosed spaces, regardless of outside temperature, there will be some heat given off from the bodies of the occupants, from processes carried on, or from the sun. Unless very careful and unremitting attention is given by some person to any system of manual temperature control, these additional supplies of heat will cause an unnecessary and undesirable temperature increase. It is fair to say that the introduction of automatic temperature regulation is the only consistently practicable means of realizing the saving in fuel to be made by utilizing to the fullest possible extent these independent heat supplies.

HUMIDITY CONTROL DEPENDENT UPON TEMPERATURE CONTROL.

In considering temperature in its bearing on human activities and comfort, we cannot lose sight of humidity, as the two are most intimately correlated. So rapid are the changes in humidity conditions following our existing methods of varying it, that manual

control is comparatively impossible. Automatic regulation of the temperatures of the untreated air and of the injection water when they are brought into contact, gives us very positive and responsive humidity control. The ability to control within very close limits the moisture content of air is necessary in many manufacturing processes, and so intimate and remarkable are the results following the automatic control of moisture content in such cases that we believe the future along this line holds wonderful possibilities. The saving of materials in process of manufacture otherwise wasted because of inconsistent or improper reactions must here be credited to automatic temperature regulation.

CONTROL OF TEMPERATURE OF DOMESTIC HOT WATER SUPPLY IMPORTANT.

The temperature of all domestic hot water supplies should be controlled automatically, as not only waste in fuel, and rapid deterioration of valves and packing, but serious scalding may result from overheated water. By domestic supplies we mean all water used for lavatories, laundries, baths, etc., whether in homes or offices or factories. In this connection the death in Chicago of a two-year-old child within the past month would have been averted by automatic temperature regulation of the hot water.

EXISTING CONDITIONS.

In general, manufacturing plants the country over, however heated, are without any automatic temperature regulation. When the weather is such that the heating plant causes discomfort, they open the doors and windows, and very seldom shut off any heating surface or reduce materially the coal consumption. Too often such neglect is based on the idea that exhaust steam is of no value, although in making it about nine-tenths of all the fuel burned was required, and in wasting it this nine-tenths is wasted. Automatic temperature regulation is at present vitally responsible for increased efficiencies in manufacturing processes, particularly as regards the saving in time. It has made possible the drying of lumber in months where it formerly took years. It has simplified greatly the production of many sorts of prepared food—such as is being sent abroad for the army—and has shortened materially the time required in such preparation. It should not be forgotten that the application of automatic temperature regulation in manufacturing plants usually results in the release of labor which could be used for other purposes. It is no uncommon thing, where automatic temperature regulation is not installed, to see a man devoting his entire time to the manipulation of the heating system and the windows or to the valves governing the temperatures for certain processes of manufacture.

The cost of heating buildings supplied from an outside source, especially when steam is used, is nearly always materially reduced by installing automatic temperature regulation. With such systems of heating, the occupants control the temperature in the easiest way, which is to open the windows, and seldom turn off the heat. When the coal is burned on the premises a natural human instinct to reduce labor as much as possible tends to some extent to prevent waste.

Only a few, certainly not over one in ten of the residences in this country have automatic temperature regulation, despite the very simple and inexpensive devices which, operating on the draft dampers of the heaters, will prevent any overheating and will even insure the maintenance of a reduced temperature during the night without any special adjustment.

In buildings having warm air furnaces for supplying heat, automatic temperature regulation, since it prevents to a great extent any hard firing unless ample cold air is being admitted or unless the building requires the heat, will make for longer life in fireboxes, grates, etc. In such installations, also, for the same reason, there will be materially less danger of fire from overheated parts of the apparatus.

A fair share of all of the public buildings are equipped with automatic temperature regulation, particularly those buildings having mechanical ventilation. This is done not only because fuel economy is sought, but also because, with such ventilation very rapid air changes are necessary and manual temperature control is impossible. There is a decided tendency to install automatic temperature regulation for street and railway cars, in order to take the fullest advantage of the heat given off by the occupants.

Practically all air conditioning apparatus wherever installed, if successful, has automatic temperature regulation in connection with the humidity control. Hot water domestic service heaters in public buildings are usually, when heated by steam, provided with automatic temperature control. We believe that comparatively few such heaters for residences and manufacturing plants are so controlled, though very simple and economical devices for the purpose, operating on the heater drafts, are available.

AUTOMATIC CONTROL IN OPERATION HALF OF TIME.

We believe that where automatic temperature control is installed, the device will be in operation limiting the emission of heat and

the waste of fuel for fully one-half of the time during which the heating apparatus is fired.

It is unfair to claim from this a fuel saving of 50%, of course, since all sorts of heating plants reflect at the fire rather sluggishly the conditions in the building. With electrical heating, the saving is nearly directly in proportion to the hours turned off. With steam heating there is a constant heat loss from the pipes, and when the steam is turned on a cool radiator the rate of condensation momentarily is excessive. When steam is turned off from all the radiators or a large percentage of them, the pressure at the boiler increases rather slowly, and while such pressure increase is reflected ultimately in the rate of fuel consumption, it may be many minutes after the radiators are closed. With hot air heating in residences, for instance, where the temperature is controlled by the draft damper, even though the draft be decreased it will take some minutes for any decreased combustion rate to be manifest.

Observations of many different types of automatic temperature control, under varying conditions, and all available tests of such systems indicate strikingly that in order to maintain closely any fixed temperature there must be an almost continuous movement of the dampers or valves. Such persistent and continuous adjustment by hand is well nigh impossible.

RECORDS OF ACTUAL SAVINGS.

The following are some well authenticated records of actual savings:

1. Test by F. A. DeBoos in Kansas City, Mo., in an office building, heated by direct steam. (Proceedings of The American Society of Heating and Ventilating Engineers.) The steam was shut off 63% of the time between 8:00 a. m. and 6:00 p. m. during February, with an outside temperature of 29° although the temperature inside was maintained at 70°. These observations also indicated that the valve must be opened and closed around 2,500 times during a heating season, holding the room temperature within a range of one degree from the point desired.

2. Simultaneous tests of the temperature and condensation of two buildings of practically equal size at the University of Illinois (Prof. A. C. Willard) show a consistent decrease in the amount of steam required by the automatically-controlled building as the outside temperature increased, while the manually-controlled building became too warm as the outside temperature increased, with very little decrease in the amount of steam used. A saving of 17% of the steam required was made at the university, by maintaining 70° rather than 75°. The exact percentage of saving possible is difficult to prove.

3. Consistent observation extending over many years, by the boards of education at Toledo, Ohio, Erie, Pa., Kansas City, Mo., and other places where buildings of similar type and size are equipped with similar heating systems but with and without automatic temperature regulation, show an average saving of around 15% of the total fuel consumption per season by using automatic temperature regulation.

4. The introduction of automatic temperature regulation to street cars, as shown by tests made by the Chicago Railways Company and which, since electric heating was used were easily computed, show a saving by preventing overheating of well over 50%. This saving computed on the basis of 3 lbs. of coal per kw.-hr. means, for the 50,000 electrically-heated cars in the United States, a saving of nearly 750,000 tons of coal per season.

5. A two-weeks test was conducted in a residence at Overbrook, Pa., supplied by a central heating plant. The first week the plant was operated under hand control, and required an average of 2,180 lbs. of steam per day (measured by condensation). During the second week the house was under automatic control, and the average amount of steam consumed per day was 1,500 lbs. During these two weeks the average outdoor temperature was practically the same. This shows a saving, therefore, of 680 lbs. of steam per day, or at 50c per 1,000 lbs., 34c per day (American Radiator Company). The saving is over 31%.

6. F. W. Ballard in a paper read before the Ohio Society of Mechanical and Electrical Steam Engineers, describes a central heating plant operating at Cleveland, equipped with automatic temperature control. To quote from his statement: "This has been found in some cases to reduce steam consumption by as much as 25% to 30%."

7. Automatic temperature regulation installed on the heating plant in the First National Bank Building at Peoria, Ill., showed a saving of approximately 33⅓% in a test extending over a period of eight months as compared with the corresponding months of the previous winter. The test was conducted and the statistics were compiled by H. R. Wetherell of the National District Heating Association. The net saving in this building for the year was $158.95, which was considerably more than the cost of the very simple, self-contained type of automatic control installed.

8. H. A. Woodworth, M. E., Merchants Heat & Light Company, Indianapolis, Ind., made a seven-day comparative test on a

building with and without automatic temperature regulation, and developed a saving of about 35% in steam consumption through the introduction of the regulating equipment.

9. A large store at Hartford, Wis., heated by steam from a central station, and so having ready means of measuring the condensation, saved nearly $200.00 in one season by installing a single unit automatic temperature regulator.

COSTS.

The cost of installing automatic temperature control to an existing plant varies, of course, with the conditions. In manufacturing buildings, it is often possible to control a large number of heating units in the same room with one thermostat. While perhaps not so minute regulation will have thus be accomplished, a general condition will be attained of preventing overheating.

Where the building is considerable in size and has many rooms, a system of regulation having many units—such as the type using compressed air as motive power—or an electrical system, is least expensive and most satisfactory. With its control of each unit of radiation, varying the amount of heat as the varied exposure and heat source conditions of the building require, such a plant must reach a high efficiency. Maintenance seems to cost annually not to exceed 2% of the cost of the plant.

For buildings having but one or two rooms, and for residences of reasonable size, however heated, single-unit regulators, which may be self-contained, or electric or mechanical, give satisfactory results and the maintenance cost is negligible.

It may be roughly stated that a good system of automatic temperature regulation may be installed in a building for from 5% to 10% of the cost of the heating plant.

CONCLUSIONS.

The installation of automatic temperature regulation, or system for prevention of excess temperature, is a justifiable investment for all heating systems inasmuch as it very positively contributes to:

1. Conservation of fuel.
2. Improvement in health.
3. Gain in personal efficiency.

Those installations in which it is particularly a desirable and wise addition are:

1. All manufacturing plants in which a temperature of 60° F. or higher is maintained.
2. All offices.
3. All residences. For the smaller residences the type which has but one thermostat, operating on the heater drafts, gives excellent results.
4. All buildings heated from central stations, and particularly those having steam service. For many of these the single unit type of control is ample.
5. All buildings having mechanical ventilation. The air changes are so rapid and involve such quick temperature fluctuations that automatic temperature regulation is imperative from the comfort standpoint as as for many other reasons.
6. All service hot water heaters, particularly those having coils which are supplied with steam. The savings to be made are very great. Prevention of scalding is positive. Steam supply to the coils, or the drafts of the coal fired heater, or the supply to the gas fired heater may be controlled by automatic devices limiting the temperature of the water.
7. All manufacturing processes in which the exact control of the moisture contained in the air and the temperature of any of the materials are of importance.
8. All railway, elevated or street cars used for transporting human beings, particularly those heated by electricity.

For data incorporated in this report acknowledgment is due to Dr. E. V. Hill, of the Chicago Department of Health, to A. R. Root, of the American Radiator Co., Chicago, and to H. W. Ellis, of the Johnson Service Co., Milwaukee, Wis.

The committee submitting the foregoing report is made up of Samuel R. Lewis, chairman; F. F. Aldridge, L. P. Breckenridge, F. A. De Boos, H. A. Harris, M. C. Honeywell, F. W. Powers, H. W. Sweatt, W. S. Timmis and A. C. Willard.

Iowa State Fuel Administrator on Fuel Waste.

"It's the waste—the unconscious, often unconscionable waste—of fuel in our homes that we must overcome now," declared Charles Webster, the Iowa fuel administrator, in a recent interview given to a representative of the *Des Moines Register*.

"It isn't the poor who waste fuel," said the fuel administrator, "nor is it the business man. In office buildings and stores, as well as in factories, the heating is done with reasonable economy. The business man counts the cost. It is in our homes.

"Last winter while calling on a neighbor, the conversation turned to the war and fuel. I had noticed the house was overheated, so I remarked: "You seem to have 'fuel to burn'—your home seems opressively warm.' 'That's the trouble with our furnace; it's either too hot or too cold,' replied the lady in a despairing tone, as if it was the act

of God whether her house was too warm or cold. 'Where is your thermometer?' I asked. She kept that outdoors to show the outdoor weather, she said. She didn't need it in the house, because it was easy enough to tell when she was warm or cold.

"Haven't you a heat control of some kind?" Yes, they had a chain that connected with the dampers of the furnace, but she never used the chain until it got either too hot or too cold for comfort—and of course, she couldn't sit there all the day moving that chain up and down.

"That," said Mr. Webster, "is the case in thousands of homes. The house is either very warm or uncomfortably cold. When it goes over 68° F., you are wasting fuel and when you get the house cold, the tendency is to waste fuel to get it back to a comfortable temperature again.

"Thermostats that regulate the damper and draft of furnace or boilers are so cheap, considering the amount of fuel saved, that every home ought to have one. Any builder will tell you that a thermostat is as essential to making a house 'modern' as a bathtub—all new 'modern' houses are using them. They can be installed on any kind of a heating plant in any old house—and in one season they make good the cost in fuel saved.

"The first questions I ask a man when he complains to me about fuel is: 'How much do you waste? Have you got a heat control on the heating plant in your home?' I figure we could save 10% to 15% on our fuel if we all used thermostats."

MODERN PRACTICE IN VAPOR HEATING

VI.—The Moline System.

Editor's Note.—*For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere, or slightly below, or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

The Moline system, which has been developed by the Moline Vacuum-Vapor Heating Co., Moline, Ill., possesses some unique features not encountered in any of the other systems previously discussed. One of these innovations is the use of a lock-shield globe valve on the return end of each radiator and another is the use of an ejector fitting to produce a pull on the return lines of greater intensity than can be secured by simply opening the return line to the atmosphere or even by connecting the air-vent line to the chimney and employing the chimney draft.

The piping system, of which a typical arrangement is illustrated in Fig. 2, consists of a two-pipe arrangement, the steam line carrying the steam or vapor from the boiler to the radiators and the return line carrying the air and condensation from the radiators back to the boiler. At that point the water enters the boiler and the air is drawn into the ejector fitting which discharges a mixture of air and steam into the condenser. Here the steam is condensed, the water finding its way back to the boiler by way of the condenser drip (through a check-valve, along with the condensation from the return line), the air going out of the system through the special air trap and vacuum valve.

The Moline system, while advocating the use of hot-water radiators, does not consider their use absolutely necessary; in a large number of cases where old systems employing steam radiators have been remodeled the old radiators have been allowed to remain. Of course the use of steam radiators makes it necssary to place the control valve at the bottom and for this reason alone the hot-water type is preferable.

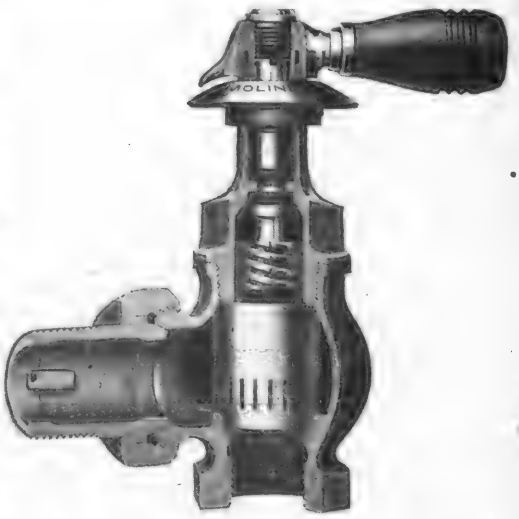


FIG. 1.—MOLINE RADIATOR SUPPLY VALVE.

The radiator supply valves, which are illustrated in Fig. 1, resemble a common globe valve in which a slotted sleeve has been placed around the disc so that the disc will open these slots or ports gradually as it rises past the openings. The number of slots in the sleeve determine the quantity of steam which will flow for a given rise of the disc and the sleeves are arranged and sized so as to suit any size of radiator.

The radiator return valves are all ½-in. and are of the lock-shield type, as illustrated in Fig. 3. They are also provided with an interior sleeve having small perforations which allow the water and air to pass without permitting the loss of an undue amount of steam. Being adjustable these valves may be set to suit any condition of service and will also permit the shutting off of the radiator and its connections in case of a leak or a broken section.

Probably the most important item in the whole system is the little steam ejector which is operated by the steam or air pressure at the end of the supply main just before it drops down to enter the boiler return. The arrangement of the device is shown in Fig. 4 which illustrates how the steam or air under pressure in the steam line blows out through the nozzle of the ejector fitting, creating, by its velocity, a suction around the jet, this suction drawing out the air from the return lines and discharging the mixture into the condenser. The connecting of this ejector near the point where the steam main drops down under the water line takes the place of an air valve at this point.

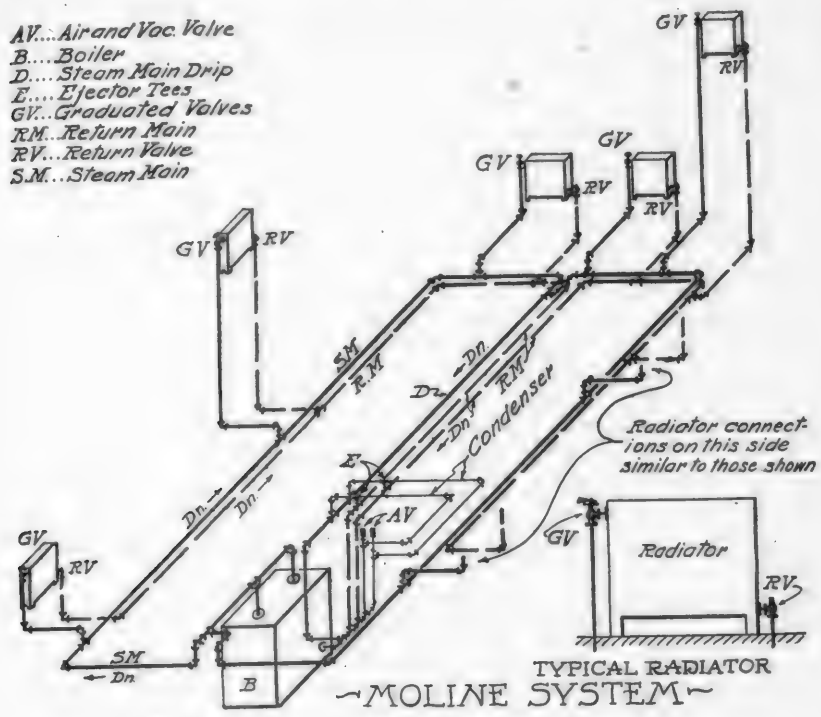


FIG 2. TYPICAL LAYOUT OF MOLINE SYSTEM.

The steam used to operate this device is condensed in the condenser coil and there gives up its heat. This heat is oftentimes made use of in a desirable way, the most common being the partial heating of the cellar by placing the condenser coil on the ceiling.

The air trap, with which is combined a

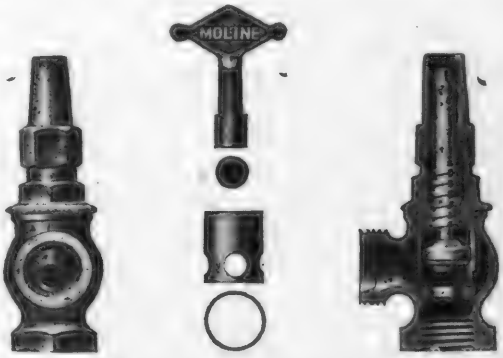


FIG. 3.—MOLINE RADIATOR RETURN VALVE.

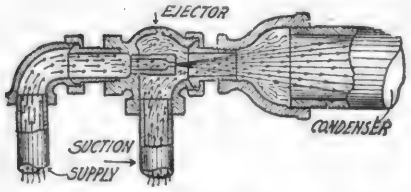


FIG. 4.—SECTIONAL VIEW OF EJECTOR.

vacuum valve, is shown in Fig. 5, the operation being as follows:

AIR VALVE AN ENORMOUS VENT VALVE.

The air valve itself is simply an enormous vent valve (when compared to the minute openings obtained with the ordinary automatic air valve) and operates by the expansion and contraction of the air contained in a float with an open bottom; no expansion post or volatile liquid is used in this trap. The trap allows the air to discharge into the pipe shown on which is placed the vacuum valve. The function of this valve is to close off and prevent the return of air into the system whenever the pressure falls below that of the atmosphere.

In sizing the piping for this system the schedule shown in Table I may be used if the length of the mains does not exceed 100 it. Each elbow should be counted as 10 ft. additional run.

No horizontal supply branch is reduced to less than 1-in. and no horizontal return branch to less than ¾-in., while all supply mains are made 2-in. or over. The sizes of risers are ordinarily made at least one size larger than the radiator valve and, if there are turns in the line, they are made two sizes larger, the increase being made immediately below the radiator valve.

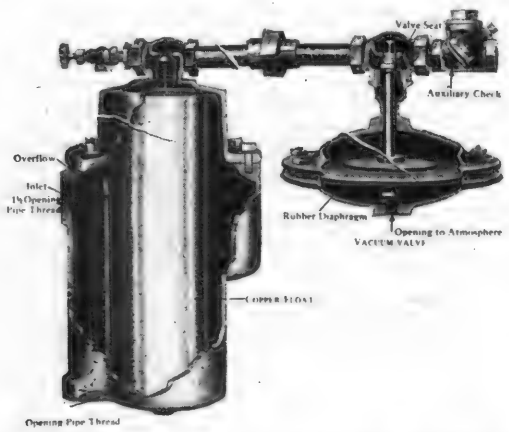


FIG. 5—AIR TRAP USED WITH MOLINE SYSTEM.

TABLE I.

Equivalent Direct Radiation Sq. Ft.	Steam Supply, In. Diam.	Dry Air and Water Return, In. Diam.	Wet Return, In. Diam.
450	2	1	1¼
750	2½	1¼	1¼
1350	3	1½	1½
2000	3½	2	2
2700	4	2	2
3600	4½		2
4700	5		2
7500	6		2½
11000	7		2½
15600	8		3
21000	9		3
28000	10		4
44500	12		4

Current Heating and Ventilating Literature.

Under this heading is published each month an index to the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

WORKSHOPS

Heating and Ventilation of Workshops. Ills. 1200 w. Engr—July 5, 1918. Arrangement of a low-pressure hot-water system with reinforced circulation. 40c.

Steam-Heating of Workshops 2000 w. Mech Wld——May 17, 1918. The principal factors involved. 40c.

STEAM HEATING

Dripping One-Pipe Steam-Heating Systems. Albert L. Baum. Ills. 1200 w. Power—Aug. 6, 1918. Measures that will tend to obviate all forms of noises and render quick heating an easy matter. 20c.

Heating Engineers Nominate New Officers.

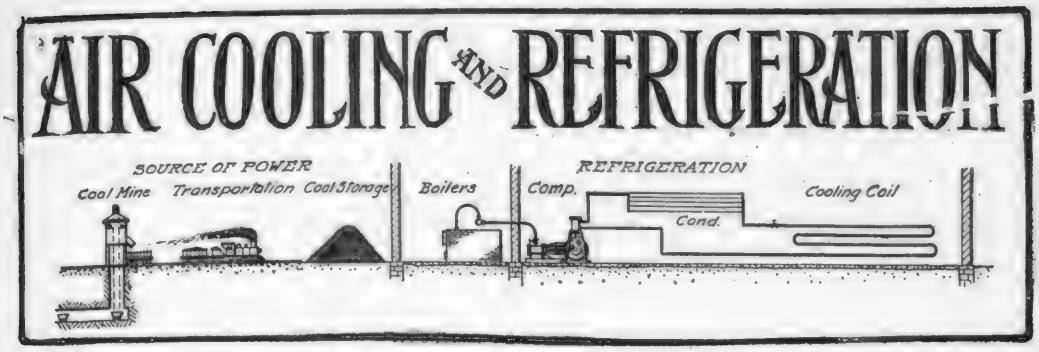
The following ticket for officers of The American Society of Heating and Ventilating Engineers has been named by the society's nominating committee, P. H. Seward, chairman:

President, Walter S. Timmis, New York.

First vice-president, Dr. E. Vernon Hill, Chicago.

Second vice-president, M. F. Franklin, Philadelphia.

Council: F. R. Still, Detroit; Howard H. Fielding, Denver, Col.; Champlain L. Riley, New York; Fred W. Powers, Chicago; Frank G. Phegley, Cleveland; Robert W. Pryor, Jr., New York; Harry E. Gerrish, Minneapolis; and George B. Nichols, Albany, N. Y.



THE ARCTIC-POWNALL SYSTEM OF ICE MAKING

It is almost impossible to consider refrigeration work without including its application to ice making; not necessarily to the large artificial ice plants but at least to small building and group building installations. As there is less likelihood in such plants of having expert ice employees and owing to the probability that the persons so utilized from time to time will do this work somewhat as a side issue, along with their other more engrossing duties, it is most essential to make the handling of the artificial ice as easy as possible and to make the production of a fine clear and sparkling product assured without an undue amount of attention in the interim. One of the most successful methods of producing clear, sparkling ice with the minimum amount of labor and the maximum amount of facility is embraced in the Arctic-Pownall system, a brief outline of which is covered in this article.

The plan shown in Fig. 1 is that of the freezing tank, the one illustrated being of 35 tons capacity and utilizing 300-lb. cans. The sections of the tank at the top show how the cans are arranged—sixty to a section and six cans wide by ten cans long. The circulation of the brine is indicated by the arrows but the exact manner in which this is accomplished is more readily understood by reference to Fig. 2 which is a general cross section of the freezing room.

The vertical centrifugal pump P at one end of the central canal picks up the brine and discharges it through the brine cooler BC where it is cooled; this same pump also

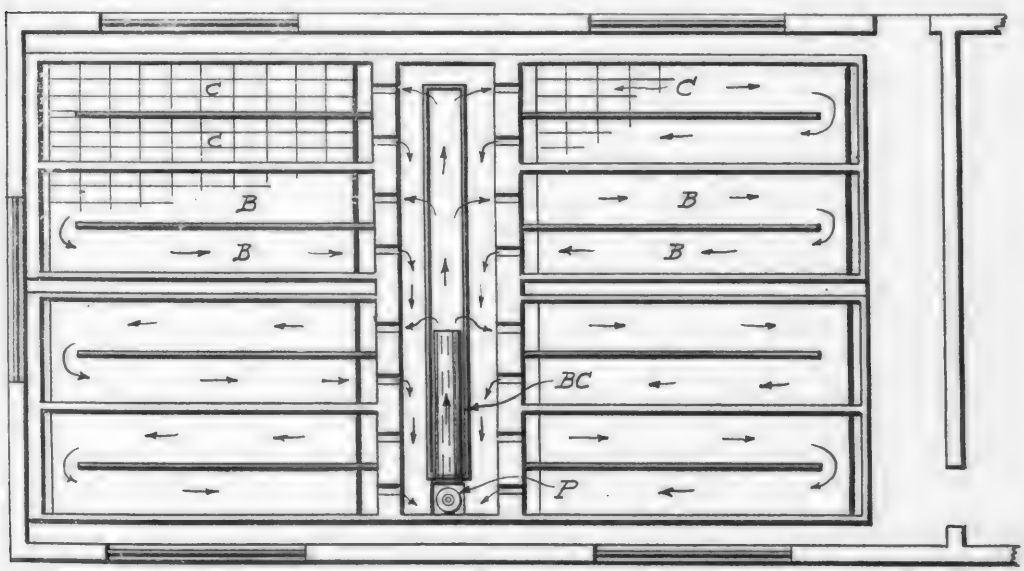


FIG. 1.—PLAN OF FREEZING TANKS USED WITH ARCTIC-POWNALL SYSTEM.

maintains a slightly higher level in the central discharge canal so that the brine flows by gravity from this central canal down through the lower openings into the various sections. After entering the sections the brine flows along past the cans located on one side of the middle baffle and around the end, returning on the opposite side of the baffle; thus all the cans are brought into the direct path of the brine flow. The brine then flows out of the upper connection between the section and the central trough which forms the return channel. The propeller pump takes its suction from the return channel discharging the brine through the cooler into the feed channel and thus begins the second round of the cycle.

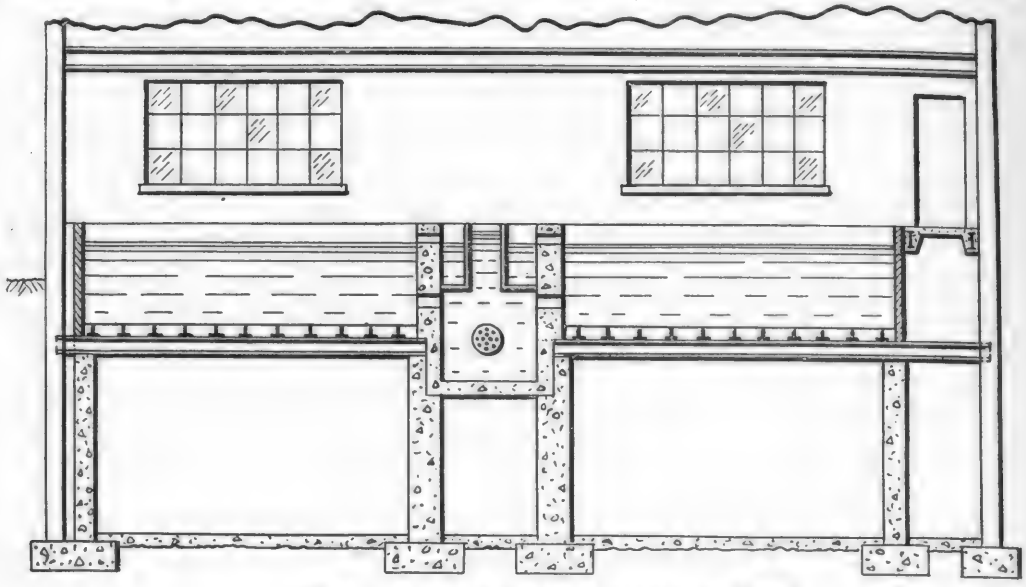


FIG. 2.—CROSS-SECTION OF FREEZING ROOM.

HOW THE ICE IS REMOVED.

The ice cans used in this system are not removable; instead they are fixed in permanent position and so remain.

When a section has become frozen the cold brine is cut off and the ice is permitted to temper. In the meantime a recharge of water for filling the cans immediately after the ice is removed has been run into a storage tank. The brine in the section or unit ready to be pulled is then circulated through the coils in the storage tank which cools off the incoming water to about 42° F. and, at the same time, warm the brine to about 36° F.

The brine warmed to 36° loosens the grip of the ice on the cans and the ice is hoisted from the can by a hand hoist, tackle, or other means, a lifting rod being frozen into the center of the top of the ice cake for this purpose. As soon as the ice is removed by the opening of one valve all the cans in the section are simultaneously refilled with water, the cold brine valve is opened and the section is ready to freeze the new charge of water.

In the freezing process to produce clear ice a certain amount of air must be frozen into the ice and the impurities (which are frozen out as the water solidifies and which are driven toward the center of the can some-

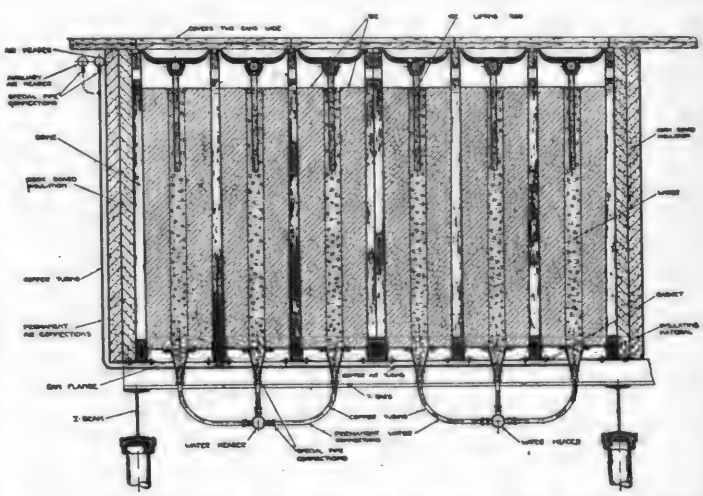


FIG. 3.—DETAIL OF TANK CONSTRUCTION AND PIPING CONNECTIONS.

times producing a hard and bitter "core") must be gotten rid of before the can is fully congealed.

This is accomplished by making a bottom pipe connection to each can. Through this bottom connection the can is not only filled with water but air also is introduced constantly during the freezing process.

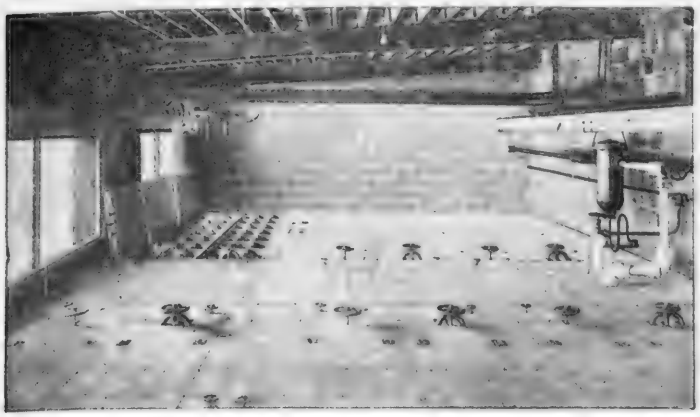


FIG. 4.—VIEW OF FREEZING ROOM WITH SOME OF CAN TOPS OPEN.

A detail of the tank construction and the piping connections for same is shown in Fig. 3. It will be noted that the air header is run close up under the floor of the freezing room and that the branches (which are made of copper tubing) drop down at each can and connect to the branch from the water header which is run below the cans.

The method of removing the core before it is frozen into the cake is as follows:

After filling the cans with water and turning on the compressed air which is maintained at about 3 lbs. pressure in the pipe the bubbles maintain a constant agitation in their rising up through the can thus washing-off the surface of the forming ice and preventing the impurities lodging thereon. As the bottom of the cans is exposed to the cold brine the ice forms first on the sides, gradually extending toward the center, the top and bottom following. When the ice has frozen so as to leave only about 10 lbs. of water in each can this water is allowed to drain off by opening a waste valve on the filling pipe. Thus all the water which might go to form an impure core in the cake is run off and the cans are then refilled with fresh water from the filling pipe. It is claimed that this scheme eliminates 98% of the impurities in the water and as all the cans in a section can be drained and refilled simultaneously the labor of so doing is very small.

To keep the brine from leaking through around the bottom of the cans a tee iron frame is used upon which the cans are supported, the frame being carried by heavier I beams. The cans are bolted tight to the tee irons and a special gasket is used between the can and the iron. After testing with water a special insulating compound is poured in which flows evenly around the bottom of the can.

The compressed air used will vary in quantity from a minimum of about 0.3 cu. ft. per minute per can up to 1.8 cu. ft. at the beginning of the freeze where very bad water is encountered. After the formation of 1-in. of ice all around the lower rate can be used for the balance of the freezing work.

A view of the freezing-room with some of the can tops open is shown in Fig. 4, the valve stems sticking above the floor being to control the brine flow to the various sections.

Notes.

On electrically-operated units a "Monogram" circuit breaker can be installed so as to automatically stop the compressor whenever the pressure unduly rises. This circuit breaker is made by the Refrigerating Specialties Co., 9 So. Clinton St., Chicago, Ill.

The De La Vergne Machine Co., New York, makes a specialty of high-speed ammonia compressors for direct connection to oil, gas or high-speed engines or to electric motors. The advantages for such an arrangement are claimed to be a saving in power of about 10%, sometimes running as high as 15% to 20%, a reduction in space of about 40% and a cutting down of the cost of engine-room equipment of about 10%.

C. G. Tagliabue Mfg. Co., has issued a new catalogue No. 370-R which is a handy reference book on indicating and recording thermometers for ice and refrigeration plants.

New Incorporations.

Lawler Tank Heater Co., Peoria, Ill., capital $100,000. Incorporators: S. B. Adelman, F. F. Mendenhall and L. Adelman.

New York Blower Co., East Orange, N. J., has been organized by Emil A. Briner to manufacture blowers, etc. Offices have been opened at 370 Central Avenue, East Orange.

THE WAR AND THE HEATING ENGINEER

Circular No. 21.

As a matter of record the restrictions of the now famous "Circular No. 21" of the Priorities Division of the War Industries Board on "Non-War Construction" are given herewith. The circular is addressed to all manufacturers, jobbers, distributors, dealers and consumers of building materials. After reciting the resolutions on which the Priorities Board had based its general policy, Circular No. 21 continues as follows:

That all interested in the manufacture and sale of building materials, as well as those interested in building projects of every character, may have a clear definition of or a ready means of ascertaining the uses to which such materials may be put, and be advised of building projects which may be prosecuted during the war with the approval of the War Industries Board, this circular is issued.

Structures, roads, or other construction projects falling within the following classifications are hereby approved, and no permits or licenses will be required therefor:

(1) After having first been cleared and approved by the War Industries Board, those undertaken directly by or under contract with the War Department or the Navy Department of the United States or the United States Shipping Board Emergency Fleet Corporation, the Bureau of Industrial Housing and Transportation of the United States Department of Labor, or the United States Housing Corporation.

(2) Repairs of or extensions to existing buildings involving in the aggregate a cost not exceeding twenty-five hundred dollars ($2,500).

(3) Roadways, buildings, and other structures undertaken by or under contract with the United States Railroad Administration or a railroad operated by such administration.

(4) Those directly connected with mines producing coal, metals, and ferro-alloy minerals; and

(5) Public highway improvements and street pavements when expressly approved in writing by the United States Highways Council.

No building project not falling within one of the foregoing classes shall be undertaken without a permit in writing issued by or under the authority of the Chief of the Non-war Construction Section of the Priorities Division of the War Industries Board.

Should one contemplating building conceive his proposed project to be in the public interest or of such essentiality that under existing conditions it should not be deferred, then he will make a full statement of the facts in writing, under oath, and present same to the local representative of the Council of National Defense, applying to such representative for his approval of the proposed construction. Should such local represtative approve the construction project, he will promptly transmit the application, stating clearly and full his reason for approving same, to the Chairman of the State Council of Defense, for his consideration. If approved by the latter, he will transmit it to the Chief of the Non-War Construction Section of the Priorities Division of the War Industries Board, Washington, D. C., for consideration, if need be, further investigation, and final decision. Should the application be finally approved by the Priorities Division a construction permit will issue which will constitute a warrant to manufacturers and dealers who have taken the pledges of cooperation above mentioned to sell and deliver building materials required in the construction of the licensed building project.

While it is not the policy of the Government to unnecessarily interfere with any legitimate business, industry, or construction project, it must be borne in mind that there is an imperative and constantly increasing demand for labor, material, and capital for the production and distribution of direct and indirect war needs, to satisfy which much non-war construction must be deferred. A full realization of this fact by all loyal and patriotic citizens, including State and municipal authorities, is all that is required to postpone such construction activities as interfere with the war program. The State and local representatives of the Council of National Defense are with confidence depneded upon to fully acquaint the whole people of these United States with the pressing need for the most rigid economy, measured not only in terms of dollars but in terms of labor, materials, and transportation service. The construction projects which must now be deferred may be undertaken when we shall have won the war and will then furnish em-

ployment to the returning artisan now on the battle front as well as those who will then be released by strictly war industries.

Yours very truly,

(Signed) EDWIN B. PARKER,
Priorities Commissioner.

Approved.

(Signed) BERNARD M. BARUCH,
Chairman War Industries Board.

Washington, D. C., September 3, 1918.

At the instance of the Merchants' Association of New York a later ruling was issued providing that practically all buildings under way could be completed and dealers in building materials could continue to supply needed material for such purposes until further notice from the War Industries Board.

War Industries Board's Priority List.

The official list of industries which are to be accorded preference in the building line, as well as a detailed statement showing what construction may be undertaken without a permit and providing a means of giving immediate consideration to proposed consrtuction through local boards, are the subject of a recent ruling of the War Industries Board.

The industries which are given preference are listed in four classes, in the order of their importance. Class I includes:

(*a*) Direct Government work and war activities.

(*b*) Hospitals and sanitariums.

(*c*) Shipbuilding and railroads.

(*d*) Practically all plants engaged in the production of food, fuel, and iron and steel products.

Class II includes:

(a) Public utilities and plants engaged in the manufacture of

1. Brass and copper products.
2. Iron and steel products, such as tools, wire rope, steel rails, ferro-alloys, and mine producing metals and ferro-alloy minerals.

Class III includes secondary items of products listed in Class I and II.

Class IV includes:

(*a*) The manufactuer of

1. Farm inplements.
2. Fertilizers.
3. Textiles.
4. Soap.
5. Pulp.
6. Paper.
7. Drugs and medicines.
8. Chemicals.
9. Boots and shoes.
10. Bags.

(*b*) Laundries.

(*c*) Newspaper plants.

This classification serves to put the business of the country on a fairly definite war basis and from it we may judge in just what direction construction work will be most active.

How to Plan Building Construction During the War.

To aid in carrying out the recent modification of the building restriction rulings of the War Industries Board, the co-operation of the 48 State councils of defense and the 5,000 county councils of defense throughout the country has been requested. Local councils will investigate the necessity for any proposed construction, and transmit recommendations to the War Industries Board. The procedure outlined is as follows:

"Any person interested in a construction project must apply, with a full statement of the facts under oath, to the appropriate local representatives of the various State councils of defense.

"This representative of the State council will investigate the necessity of the proposed construction and transmit recommendations to the State council for review.

"The State council will review the case, and, if it decides in favor of the construction, it will at once send its recommendation, with a full statement of all the facts, to the Non-War Construction Section of the Priorities Division of the War Industries Board. The Non-War Construction Section will grant or withhold the permit and so notify the state council of defense, and the individual concerned.

"If the State council decides against the proposed construction, it will notify the person concerned that his project has been disapproved.

"The War Industries Board will inform all persons applying directly to it that they must first take up their projects with the appropriate local representative of the State council of defense.

"The ability of the War Industries Board to enforce this whole plan rests upon the fact that it controls priorities and has also secured from the manufacturers of building materials a pledge not to supply materials for projects which are not authorized under the regulations of the War Industries Board."

Coal Directions Issued by Federal Fuel Administrator for Illinois.

How to handle the proposition of using one-third bituminous coal and two-thirds anthracite coal, which is now before the

householders of Illinois, is answered by the U. S. Fuel Administrator for Illinois, who states:

No householder need suffer for fuel during the coming winter, providing he follows the directions of the fuel administration. Co-operate.

Sixty-six and two-thirds per cent of the hard coal (anthracite) used during the period from April 1, 1916, to March 31, 1917, has been allotted Cook county consumers, who are exceedingly fortunate in being one of but thirteen counties in Illinois which will receive hard coal.

One-third of the hard coal needs must therefore be supplied with soft coal. Your patriotic co-operation to meet this situation is desired.

Hard coal (anthracite) has not been distributed heretofore as directed. It is our responsibility to see that the public does not suffer. Therefore we instruct both dealer and consumer—

1. That base burner, heating stove, kitchen stove or range, and hot-water supply-heater consumers who used hard coal (anthracite) during the period from April 1, 1916, to March 31, 1917, order now their entire requirements from the dealer who supplied such consumers during the period from April 1, 1916, to March 31, 1917. All of their requirements up to two tons each, including coal now in their bins, will be delivered to each consumer on or before October 20, 1918. The balance to which the consumer is entitled will be delivered to him as receipts of hard coal (anthracite) warrant after October 20, 1918.

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2. That furnace (hot air, hot water, steam, and vapor) consumers will not be permitted to receive, and dealers will not be permitted to deliver, hard coal (anthracite) for use in such furnaces before October 20, 1918, and then not until such consumer has stored for consumption soft coal equal to one-third of the previous annual coal consumption of such consumer. Soft coal must be burned in all furnaces until Christmas, 1918, and the hard coal saved for severe winter weather. If soft coal supply is not now in your bins, get it now, while it is available, weather is good, and streets clear. Of the two-thirds of furnace consumers' hard coal (anthracite) allowance, one-half should be delivered to the consumer between October 20, 1918 and November 25, 1918, which will be thirty days before the same may be used in furnaces. The balance of the allotment to furnace consumers will be delivered as received after November 25, by the dealer who supplied the house or apartment now occupied by such furnace consumer during the period from April 1, 1916, to March 31, 1917.

3. That consumers having Spencer heaters, Newport boilers, and similar type heating plants that used buckwheat-sized hard coal (anthracite) or pea-sized coke during the period from April 1, 1916, to March 31, 1917, may receive and dealers who supplied such consumers during that period may now deliver one-third of the annual requirements of consumers having those types of heating plants. After all consumers having the above type of heating plant, who have applied to their respective dealers, have been supplied with one-third of their annual requirements of buckwheat-sized hard coal or pea-sized coke, a second one-third of such annual supply may be delivered by the dealer to the consumers so supplied by him, there being a sufficient supply of buckwheat-sized hard coal (anthracite) or pea-sized coke to supply now two-thirds of the anual requirements of consumers using that fuel.

4. Dealers must return to consumers all orders they have from consumers whom they did not supply from April 1, 1916, to March 31, 1917, and consumers must place the same with the dealer who did supply their needs during that period.

5. Dealers must take all orders tendered to them by consumers who were their patrons between April 1, 1916, and March 31, 1917, and from new residents in houses to which they supplied hard coal (anthracite) during that period.

6. Hard coal (anthracite) consumers who cannot get dealers to take the orders or who cannot find what dealers supplied the house they now live in, during the period from April 1, 1916, to March 31, 1917, or who bought of dealer now out of business, must file their orders, properly certified to, at this office, 306 South Wabash avenue, Chicago.

Fan Manufacturers Form War Service Committee.

In accordance with a request of the Electric and Power Equipment Section of the War Industries Board, a war service committee has been formed of fan manufacturers, made up of J. F. G. Miller, American Blower Company; H. W. Page, B. F. Sturtevant Company; Charles Clarage, Clarage Fan Company, and H. W. Wendt, Buffalo Forge Company. The fan manufacturers are asked to furnish the government with all available data regarding the fan makers of America, including the names of the various companies, chief executives, etc.; also the principal engine and turbine builders that each manufacturer depends on

for motive power, together with other information.

The fan manufacturers have arranged to have an executive representative of each company in Washington to confer with the War Industries Board to see how fan manufacturers can best co-operate with the government. The work to be accomplished by the fan manufacturers includes the elimination of sizes and types of apparatus not necessary, for the period of the war, and to place information before the War Industries Board of the capacities and schedules of each company for each class of apparatus built by it which is used in the conduct of the war. The committee will also present to the War Industries Board the requirements of fan manufacturers for outside purchases of motive power.

In a second report the committee recommends to the fan manufacturers the elimination of all sizes and types of apparatus not necessary to win the war. All members are urged to present a list of all different sizes and types of apparatus they are prepared to build, and a separate list of those types and sizes they are prepared to discontinue for the period of the war. The committee recommends that the following be discontinued: cast-iron volume exhausters or blowers larger than a 30-in. planing mill fan; also special discharge fans, and steel plate fans for heating and ventilating work. The making of only one type of engine is also recommended. It is urged that odd sizes of cylinders be eliminated, unless 20 or more are made on one order.

The Official Facts on Our Fuel Problem.

In a statement issued by the Committee on Public Information, Harvey O'Higgins, associate chairman, states:

The war programme of the nation demands 80,000,000 more tons of coal this year than last. We are calling for 8,000,000 tons of steel ships and to manufacture and deliver the steel for them will take 14,000,000 tons of coal. 3,000,000 tons are needed to carry our average monthly delivery of troops to Europe, and 4,000,000 tons to transport their supplies. One hour of intensive artillery action at the front uses up 1800 tons of steel, which it takes 7200 tons of coal to produce. To manufacture and transport the 60,000,000 shells that were fired by the French in the battle of Verdun called for the consumption of nearly 9,000,000 tons of coal.

The demands for coal this year have increased in American industrial plants 18%; in gas and electric utilities, 15%; in shipping, 30%; in the railroads, 7%; and in domestic consumption, 13%. It has been impossible to provide for these increases by increased production. There have been 224 new mines opened and weekly production has risen as high as a 17% increase over the corresponding week of 1917, but there has not been the necessary mine labor available to meet the whole demand and there have not been coal cars enough to keep the coal moving from the mines.

In an attempt to meet the deficit, the Fuel Administration has carried out a thorough campaign of saving. It has undertaken to inspect the country's 250,000 steam-producing plants, and hopes to save thereby 20,000,000 tons of coal a year. As a result of this inspection in Connecticut alone 80 plants are saving 50,000 tons annually. In Chicago three plants are saving 74,000 tons by substituting electricity and water power for steam.

It is evident, however, concludes the statement, that the greatest economies will have to be practised this winter in order to avoid another serious coal shortage.

Women Taking Up Engineering.

Unusual and radical changes are taking place daily as a result of war demands, states A. H. Krom, director of engineering of the U. S. Employment Service. Up to the present engineers as a class have been governed largely by tradition. Once a mechanical draftsman, always a mechanical draftsman. Now technical men are changing from one line of work to another.

"Oddly enough," says Mr. Krom, "they are changing their attitude toward technical women. We are daily getting calls for women to do drafting for service in new and unaccustomed lines of work."

Heating Men in Military Service.

Frank Van Inwagen, vice-president of the Illinois Engineering Co., Chicago, Ill., has finished his course at the United States Naval Academy at Annapolis, and has been assigned to duty as ensign on a transport in overseas service. He completed his course at Annapolis in four months.

Harold S. Maddock, of the Thos. Maddock & Sons Co., Trenton, N. J., has received his commission as first lieutenant. He was made a second lieutenant five months ago. Lieutenant Maddock is stationed at Camp Dix.

Major J. W. H. Myrick of the Ancient and Honorable Artillery Company of Boston, and president of the Autoforce Ventilator

Co., Boston, has recently been appointed chairman of the Board of Instruction, Local Board Selective Service Division 6, City of Boston. Major Myrick has been assigned to take draftees to the rifle range at Wakefield. Other offices held by Major Myrick are vice-president of the National Matches Civilian Teams Association and director of the National Rifle Association.

New York Chapter Compiles Standards for Mechanical and Natural Systems of Ventilation.

Standard conditions that should obtain in a school room with a mechanical system of ventilation and with the open-window or similar method, were presented at the opening meeting of the New York Chapter by a special committee appointed for the purpose. The compilation is a direct result of the agitation started by the New York City Department of Health virtually proposing that future New York public school buildings should be ventilated by natural means.

The meeting was held at the Building Trades Employers' Club and was preceded by a "Forbes" dinner. As a preliminary to the main business of the evening James A. Donnelly presented a large number of stereopticon views on war subjects, many of which were unusually thrilling. The scenes shown were mostly of the western front.

President Seward announced that the society's committee on research was now ready to proceed with the work of establishing a research laboratory at the station of the Bureau of Mines, in Pittsburgh. He stated that ten men would be appointed from the New York Chapter to canvass the trade in the metropolitan district for the necessary funds to maintain the laboratory.

He also announced that at the request of the local fuel administration authorities, a report on conservation of fuel had been prepared by a committee headed by Thomas Chester. This report was considered so useful by the New York fuel administration that copies of it were forwarded to all county fuel administrators throughout the State with instructions to see that the recommendations were put into effect.

In the absence of Perry West, the chairman of the committee on school room ventilation, the report of this committee was presented by A. S. Armagnac. He stated at the outset that the committee was a unit in its feeling—that there was no need of a controversy between the various schools of thought on the matter of ventilation but that, on the contrary, any system is acceptable and to be recommended provided it meets the requirements. The work of the committee, therefore, was focused on defining the requirements. Following is the committee's report:

Your Committee appointed by President Seward to formulate a report as the basis of discussion on the above subject at the October meeting of the Chapter has to report as follows:

1st. That it is the sense of this committee that the heating and ventilation of school rooms, having to do as they do with the comfort, health and welfare of the school children, who in turn form such a large percentage and such an important and susceptible portion of our population, are deserving of the highest consideration from the members of our profession, as well as from all others connected with this subject.

2nd. That we recommend that this subject be taken out of the class involving controversies between advocates of different methods of heating and ventilation and placed purely on the scientific basis of defining and maintaining proper conditions by whatever method is best suited under the particular conditions to be met.

3rd. That we recommend the following as standard requirements for proper air conditions in a school room:

Dry-bulb temperature—65° F. to 70° F. (standard 67° F.)

Relative humidity—From 60% at 65° F. to 40% at 70° F. (standard 50% at 67° F.)

Dust counts per cubic foot of air—(a) Not over 5000 particles with Hill dust counter.
(b) Not over 150,000 with Palmer dust counter.
(c) Not over 1500 with Graham-Rogers plate.

Bacteria counts on a two-minute plate—10 (showing on gelatin at 20° C. in four days).

Cubic feet of air per pupil per minute—20 to 40 (standard 30 cu. ft.) with a distribution of 90%, and with not more than 10 parts of CO_2 in 10,000 parts of air by volume.

Odors.—The room to be practically free from objectionable odors, gases, and other objectionable foreign matter as determined by one coming in from the outside air.

Air motion at the air inlets to be from 2 to 3 miles per hour (175 to 265 ft. per minute).

4th. If in any case these conditions can be properly and economically maintained with-

out a mechanical ventilating plant, either by means of open windows or by natural means, a mechanical plant could be omitted. That in our judgment this would require:

A minimum of 500 cu. ft. of air space per pupil, with windows on at least opposite sides of the room.

Automatic humidifying apparatus for each classroom.

Positive means for exhausting foul air.

Outside air conditions showing not more than 6000 particles of dust with Hill dust counter (or equivalent) per cubic foot, or 25 counts of bacteria on a two-minute plate for any considerable time during the school year.

Practical freedom from objectionable odors and gases in the air surrounding the building.

Proper regulation of the windows and other items of the natural method at all times to correspond with the outside weather conditions.

In the ensuing discussion the various sections were taken up in detail and the discussion showed that the report as a whole met with the approval of those present.

Before adjourning President Seward announced that the November meeting, on November 17, would be devoted to "Coal Requirements in House Heating Systems."

Illinois Chapter Elects New Officers.

The first meeting of the Illinois Chapter for the year 1918-1919 was the occasion for the election of new officers. Those elected were: President, G. W. Hubbard; vice-president, E. J. Claffey; treasurer, August Kehm; secretary, Alfred E. Stacey. Board of governors: Dr. E. Vernon Hill, Lloyd Howell and John C. Hornung.

The topic for discussion was "Mechanical Versus Window Ventilation for Schools." Professor John W. Shepherd, of the Chicago Normal College, raised the point that inefficient temperature control was a frequent cause of failure on the part of mechanical systems to give the desired results and that a higher grade of intelligence is needed on the part of janitors and engineers in charge of the mechanical equipment.

Other speakers paid their respects to the architects who so frequently place restrictions upon the ventilating engineer, especially with respect to the distribution of flues in a building.

The sentiment was unanimous in favor of the mechanical system and the opinion expressed that nothing in the much-discussed tests, reported by Dr. S. Josephine Baker, which were made in the New York City public schools, was sufficient to alter this conclusion.

Annual Meeting of Kansas City Chapter.

New officers were elected at the opening meeting of the Kansas City Chapter which was also the chapter's annual meeting. The report of the nominating committee was unanimously adopted, the new officers being as follows: President, J. G. Pease; vice-president, William N. McIntyre; treasurer, B. Natkin; secretary, John H. Kitchen. Board of governors: F. J. McMorran (chairman), Walter E. Gillham and Martin Hauser.

It was decided to devote the November meeting to a discussion of mechanical versus natural ventilation.

In spite of the fact that over 25% of the membership of the chapter is engaged in war work, the attendance compared favorably with that of previous meetings. Six new members have been added to the roll since the last meeting.

The chapter has been requested to formulate ventilating requirements for the use of the Kansas State Teachers' Association. This work will be undertaken by the chapter's legislation committee, consisting of Messrs. Field (chairman), Natkin, McMorran, Downes, Gillham and Kitchen.

Minneapolis Public Schools to Be Limited to 75% of Normal Amount of Fuel.

One of the first cities to put into effect a fuel-rationing plan for its public school buildings is Minneapolis. In a notice just sent out to the principals and engineers of its public school buildings, Business Superintendent George F. Womrath has promulgated rules designed to save 25% of the normal amount of fuel burned, the instructions superseding all previously-issued rules where any conflict occurs. We are indebted to A. L. Sanford, mechanical engineer, for a copy of the rules, which are as follows:

"1. Engineers will start fires and furnish steam in buildings when the outdoor temperature at 7:00 a. m. on school days is 50°F. or less. When the outdoor temperature is between 50° F. and 55° F., the engineer shall use his discretion about starting fires, depending on the outlook, whether the day will be cloudy and cool, or fair and warmer.

"2. Continuation of firing of boilers on a warm day with windows and doors open is a needless waste of fuel and will not be tolerated. Engineers should bring rooms to proper temperatures, shut off steam valves

ENGINEER'S WEEKLY REPORT

MINNEAPOLIS PUBLIC SCHOOLS

OFFICE OF THE BUSINESS SUPERINTENDENT
BOARD OF EDUCATION
GEO. F. WOMRATH

WEEK ENDING _____ SCHOOL _____

DAY	BOILER DATA: HOUR FIRES STARTED NO. 1	NO. 2	NO. 3	NO. 4	HOUR FIRES BANKED OR PULLED NO. 1	NO. 2	NO. 3	NO. 4		POUNDS OF COAL FIRED	POUNDS OF ASH REMOVED
SUNDAY											
MONDAY											
TUESDAY											
WEDNESDAY											
THURSDAY											
FRIDAY											
SATURDAY											

DAY	Outdoor Temperature 7:30 A. M.	5:00 P. M.	FAN OPERATION: Hour Started—Morning	Length of Time Stopped At Noon	Hour Stopped—Night	Hour Cold Air Damper Opened	Hour Cold Air Damper Closed	SATURDAY METER READINGS			READINGS MADE BY SERVICE COMPANY	
SUNDAY								WATER				
MONDAY												
TUESDAY								GAS				
WEDNESDAY												
THURSDAY								ELECTRIC LIGHT				
FRIDAY												
SATURDAY								ELECTRIC POWER				

Signed _____ Engineer.

FORM FOR RECORDING DAILY CONSUMPTION OF FUEL.

bank fires, holding boiler in readiness for sudden temperature changes during school hours.

"3. The Fuel Administration has requested that if rooms should rise above scheduled temperature the steam be shut off rather than windows opened. Principals and engineers will see that this request of the Fuel Administration is enforced.

"4. Outside hall doors are to be kept closed consistently. If two or more outside doors are open, the entire corridor is soon robbed of all heat, placing an added tax on the heating system. It is recommended that the principal in each building will station two or more of the older boys at the hall doors to open and close all hall doors immediately before and immediately after the children leave or enter the building.

"5. In order to keep loss of heat from building at a minimum during night, engineers or janitors are to draw window shades completely, covering glass exposure. Shades to be left down until arrival of teachers. This is not imposing any extra work on the janitors as the rules already call for lowering the shades halfway.

"6. Wherever practicable it is requested that furnace fires be banked at night in order to keep boiler settings at an even temperature and save fuel, kindlings, gaskets, etc.

"7. Following are the maximum temperatures to be followed during the season 1918-19:

Class rooms	65°-68° F.
Gymnasium	55°-60° F.
Swimming pool	70°-72° F.
Showers and dressing room	70°-72° F.
Shops and manual training	60°-65° F.
Toilets	50° F.

"8. Direct radiation will be used for all heating, and windows for ventilation until November 1, at which time all fan systems will be started. After November 1 no open windows or window screens will be allowed.

"9. At schools having sufficient exhaust steam from fan engines and pumps, the fan may be run before November 1 and the fan coils used for heating the building. As soon as the building is heated, the fan must be shut down.

"10. The following procedure for starting fan systems will be followed:

"As soon as coils are heated and fan and engine started, open cold-air dampers for a few minutes in order to fill entire building with fresh air. Then close cold-air dampers and re-circulate air within the building until classes start. Do not turn steam on direct radiation until after re-circulation of air has

been started. Wherever humidifiers are installed they are to be used continuously during operation of fans.

"11. In order to comply with the requests of the Fuel Administration and as a basis for future coal allotments, it is necessary that engineers keep a careful estimate of their daily consumption of fuel. For the use of our engineers we are furnishing blanks as approved by the Fuel Administration covering the desired data. Determine the weight of contents of truck or wheelbarrow used in handling coal. Keep a record on tally sheet of number of loads used, transferring number of pounds to "Weekly report blank" at convenient time. Weekly report blanks are to be completely filled out and mailed in duplicate to the Board of Education Repair Shop, 245-9th Avenue, North, not later than each Saturday, 5:00 p. m. New monthly report blanks are being furnished and these must be filled out and mailed not later than the last day of each calendar month.

"We feel confident that each employe will cheerfully co-operate with us in following the request of the Federal Fuel Administration as outlined above, as this is a patriotic measure and is a means of determining each man's loyalty to the United States Government."

Report on Space Required for Heating and Ventilating Plants.

A special meeting of the Committee on Standardization of Schoolhouse Planning and Construction of the National Education Association was held recently at the headquarters of the heating engineers' society, in New York, to further consider the space requirements of heating and ventilating plants. Those present included Frank Irving Cooper, chairman, Frank G. McCann, chief of the division of ventilation, New York Department of Education.

Other features of the committee's work that came up for consideration included fire prevention and protection, and safety to lives. Charts were exhibited illustrating these features, as well as the percentage of space allotted to sanitary facilities in various types and sizes of buildings, in both grade and high schools.

Tabulations of percentages of space allotted to the various parts of the heating plant, janitorial service, etc., were prepared from a wide variety of buildings. The tables showed remarkable variations in allowances for such spaces. Several reasons were brought forward for this, but it was decided to continue the study with a view to fixing an irreducible minimum for each part of the plant.

Bureau of Mines Finds Waste of Fuel Oil.

Fuel sufficient to operate the railroads of the United States for one month is being wasted every year by the users of fuel oil. This is the conclusion that has been drawn by experts of the Bureau of Mines, Department of the Interior, who have been co-operating with the Fuel Administration in a general survey of the use of fuel oil for power purposes in the United States. They find that last year 160,000,000 barrels of fuel oil were used and that 40,000,000 barrels, or one-fourth of the entire amount, was wasted and might have been saved by more intelligent operation of plants and proper firing. This is equivalent to 10,000,000 tons of coal.

With such a situation confronting the country, both the Bureau of Mines and the Fuel Administration have sent into those parts of the country where fuel oil is extensively used a number of engineers who have been visiting the plants and demonstrating to the men where losses occur and how they may be stopped. As one result of the investigation a handbook for boiler-plant and locomotive engineers in the efficient use of oil fuel has been issued by the Bureau of Mines, giving instructions to all those who have oil-burning plants.

Definition of "Frigories."

A correspondent of the *Refrigerating World* writes to inquire the meaning of the expression "300,000 frigories par heure," and its equivalent in English, as well as the equivalent of "6000 calories un kilo." The *Refrigerating World* gives the following answer to the correspondent's question:

In the metric system as shown throughout the world, a heat unit (or calorie) means the amount of heat required to change the temperature of one Kilogram (Kg.) of water one degree Centrigrade. A British thermal unit (B. T. U.) means the amount of heat required to change the temperature of one pound of water one degree Fahrenheit. One Kg. is 2.20462 lb., and one degree C. is 1.8 degree F. One calorie is therefore equal to $2.20462 \times 1.8 = 3{,}96832$ pound - degrees or B. T. U. One American ton of refrigeration is equal to the melting effect or latent heat of fusion of 2000 lbs. of ice per 24 hours. This means 2000 lbs. $\times$ 143.4 $=$ 286800 B. T. U. per 24 hours, or 11950 B. T. U. per hour, or 199.167 B T U per minute. Therefore, $11950 \div 3.96832 = 3011.35$ calories per hour is equivalent to one American ton of refrigeration.

The object of refrigeration is to remove heat units, usually below 32° F. which is the

freezing point of water. The French think it desirable to distinguish these negative heat units (frigories) from the ordinary positive heat units (calories) and, therefore, have since a few years, commenced to speak of "frigories" in connection with refrigeration and ice making, but the heat value of frigories and calories is exactly alike, and both are equal to 3.96832 B. T. U. The "300,000 frigories par heure" (per hour) therefore represent simply 300,000 ÷ 3011.35 = 99.7 American tons of refrigeration per 24 hours.

Incidentally the British ton of refrigeration differs from the American ton of refrigeration, because based on the gross ton of 2240 lbs., which is 12% greater than the short ton of 2000 lbs. The capacity of the French plant is, therefore, equal to 300,000 ÷ 3370 = 89 British tons of refrigeration per 24 hours, or 99.7 ÷ 1.12 = 89 tons.

Are Gas Heaters Harmful to Health?

The recent receipt of circular matter on gas heating appliances made by the Sanitary Heating Company, Brooklyn, N. Y., including the Solar Grand fireplace heater which, it is claimed, "operates perfectly without a flue connection," led to an inquiry as to what became of the products of combustion. In reply, the manufacturers state:

"Permit us to say that the Solar Grand heater made by this company operates with a luminous or 'white' flame. We use 'white' flame instead of the laboratory expression of 'yellow' flame for the reason that the flame is as white as an incandescent light.

"This result is obtained by the Argand principle of promoting a perfect combustion. After combustion takes place, the products are directed through a system of superheated baffle plates and diaphragms which absorb any imperfections that might escape in the primary combustion and permits all the products to be discharged into the room without odor or offense and a 30 cu. ft. consumption laboratory test confirms this fact, and also shows that the CO properties are nil or 'not sufficient for record.' These tests have been confirmed by large laboratories in the country.

"When a purchaser is not convinced as to the sanitary qualities of the products of these heaters, we give him the option of a damper for venting the heat products into the flue. But in almost all cases practical experience soon convinces him of the unnecessary loss and waste of heat, and he soon decides to utilize all of the units, which gives him 100% efficiency."

Heating the Essington Plant of the Westinghouse Company.

In a new manufacturing plant of the size and importance of the Essington Works of the Westinghouse Electric and Manufacturing Company, at South Philadelphia, Pa., the methods of heating and ventilating are of more than passing interest. These works were erected during the past year and in the process of construction many records for speed were established.

The factory represents a new industrial development of the Westinghouse interests, which was made necessary because the East Pittsburgh plant of the company, although already very much congested does not permit of further expansion as further ground is not available. But as the constantly increasing volume of business made additional facilities imperative, the company was compelled to look elsewhere. This resulted in the acquisition of a tract of land in Delaware County, Pa., comprising 500 acres. This site is located in Essington, about nine miles south of Philadelphia on the Delaware river. Of the 500 acres 110 acres have been set apart for factory buildings proper, while the rest is to be used in the erection of houses for the employees. Already 200 dwellings are now under construction, but eventually it is expected to increase this number to about 1500 houses.

While the contemplated plans for this new development calls for a plant four times the size of its present capacity, an idea may be formed how extensive these works will eventually be when it is understood that there are now completed seven structures with a total floor space of 35 acres. These buildings are all of fire-proof construction. The material used is tile, concrete and steel. The roofs are of concrete and the windows have steel sashes. There are seven buildings, the pattern-storage, the foundry, the forge and blacksmith shop, the power house, two machine shops and one erecting shop. Ground was broken on April 1, 1917, and the first building was completed August 15, the first product was turned out in the foundry on November 20, in the same year. The first manufactured shipment from the plant was made in February, 1918, the first commercial shipment was made on March 23, and all departments were at least in partial operation on April 1, 1918, exactly one year from the date building operations had been started.

As far as the heating and ventilating problem of the plant is concerned, generally speaking, ventilation was not considered as essential, because this feature was already taken care of in the design of the buildings,

where large areas of ventilating sash are provided, and where the ratio of cubic contents to the number of occupants in each building is unusually large. Small exhaust systems of ventilation were installed in the west end of machine shops Nos. 1 and 2 to provide for unexposed offices, wash and toilet rooms. In the various shop buildings the indirect blower systems were installed, their selection being due primarily to their adaptability to this class of structure, their lower first cost and better distribution of heat, as well as convenience of operation.

Direct heating was installed in the office section of the pattern storage building as well as in the building proper. The direct heat in this case provides the necessary individual control in the offices, and the most economical system for the rest of the building. Direct heat is provided in the toilets and wash-rooms throughout the plant to prevent feezing when the indirect blower systems in the shops are shut down.

The various systems come under the general classification of "vacuum heating." Steam is supplied through large exhaust mains in tunnels to the different buildings and the water of condensation is drawn through the return mains by vacuum pumps located in the power house. Vacuum or thermostatic traps are used on each unit of radiation throughout the installation, which, in conjunction with the vacuum pumps, makes it possible to obtain a positive circulation of steam throughout the entire plant at a low initial steam pressure.

The indirect blower systems in the Machine and erecting shops, and in the foundry, were divided into two units, on account of the size of the buildings. Each unit consists of a constant-speed motor-driven blower and indirect heater. The heater is so subdivided that the air temperature may be adjusted to suit any outside temperature. The heated air is carried through a system of overhead sheet-iron ducts, with outlets carried down the columns to distribute the heat near the floor. Provision is made in each blower room, so that air may be taken directly from outside, or the war air recirculated from inside the building. It is the intention that all air be recirculated during the night, and when the shops are not in operation, as this will effect a considerable saving in steam. At other times, during mild weather, the system may be operated partly on outside air and partly on recirculated air. In extremely cold weather, it will be necessary to operate entirely on recirculated air, in order to properly heat the buildings.

This does not apply to the foundry, where it will be necessary to operate on outside air during working hours, owing to the nature of the work performed in the building.

The following data, tabulated for each building, give detailed figures regarding the size and capacity of apparatus, as well as information showing temperature ranges and length of time required to completely change the air in each building:

HEATING SYSTEMS.

Machine shop No. 1 and No. 2 (each shop):

Two-180-in. steel plate blowers, having a capacity of 57,000 cu. ft. of air per minute each.

Two-indirect heaters, containing 5,130 sq. ft. of heating surface each.

Approximate air change: One change each 46 min. temperature range, 10° to 60° F.

Erecting shop:

Two-160-in. steel plate blowers, having a capacity of 43,000 cu. ft. of air per minute each.

Two indirect heaters, containing 3,160 sq. ft. of heating surface each.

Approximate air change: One change every 56 min. Temperature range 10° to 60° F.

Foundry:

Two—160-in. steel plate blowers, having a capacity of 50,000 cu. ft. per minute each.

Two—indirect heaters, containing 5,440 sq. ft. of heating surface each.

Approximate air change: One change every 58 min. Temperature range, 10° to 50° F.

Pattern Storage Building:

Direct Heating: approximately 13,000 sq. ft. of cast-iron wall and column radiation. Temperature range, offices, 5° to 70° F., remainder of building, 10° to 60° F.

Forge shop:

Direct heating in office and toilets only.

EXHAUST VENTILATING SYSTEMS.

Machine shop No. 1:

One 55-in. steel-plate exhauster, having a capacity of 3300 cu. ft. of air per minute.

Air change: Offices, one change every 15 min.; wash-rooms and toilets, one change every 10 min.

Machine shop No. 2:

One 50-in. steel-plate exhauster, having a capacity of 2900 cu. ft. of air per minute.

Air change: Offices, one change every 15 min.; wash-rooms and toilets, one change every 10 min.

Figuring Chimney Losses by Chart.

A chart for making quick estimates of the fuel loss in almost any chimney, due to low CO_2, has been prepared by the Uehling Instrument Co., New York. In using the chart, the percentage of CO_2 (shown in Column C) is connected with the money now being spent per year for coal (shown in Column B) and the intersection of the connecting line with Column B gives the dollars lost in the form

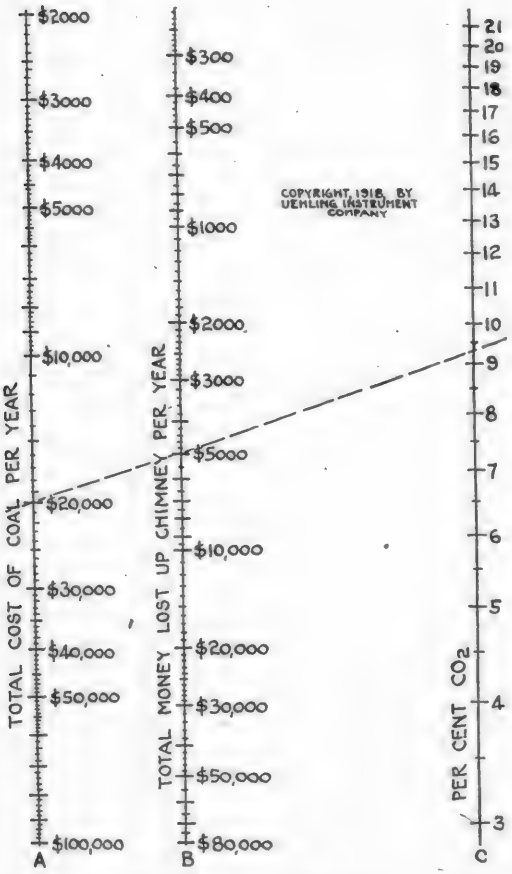


CHART FOR FIGURING CHIMNEY LOSSES.

of heated gases escaping through the chimney.

For example: If $20,000 is spent per year for coal burned in a furnace whose average CO_2 registers 9.3%, what is the approximate chimney loss per year?

Solution: Connect the $20,000 (Column A) with the 9.3% (Column C) as indicated by the dotted line drawn across the chart illustrated, and the intersection with Column B shows the approximate yearly loss to be $5,000.

This chart is based on a flue-gas temperature of 600° F. and an outside temperature of 60°F. It has been assumed that coal has a calorific value of 14,500 B. T. U. per pound of combustible.

NEW DEVICES

The Trane Master Pump.

A new type of condensation pump with only one moving part and having the advantages of both the centrifugal and piston pumps, has been brought out by the Trane Co., La Crosse, Wis. It is known as the Trane master pump. Like a piston pump it operates against high pressures, and as a centrifugal it pumps large volumes at low pressure. The impellor is the only moving part. The pump is described as requiring no oiling, is not affected by dirt and requires no repairs.

A cut of the impellor is shown in Fig. 1. This impellor, with its shaft casing and stuffing box, is all there is to the pump. Water enters the inlet, fills up the numerous pockets on the edge of the impellor and the channel around them and is drawn by the velocity of the impellor and pockets around to the discharge opening. At this point the channel is blocked by a partition so that the water must pass out through the discharge. As the pockets are emptied of water by centrifugal force, both are emptied and are ready to receive a new supply of water as soon as they reach the position directly under the inlet opening.

Although the pump is apparently simple in

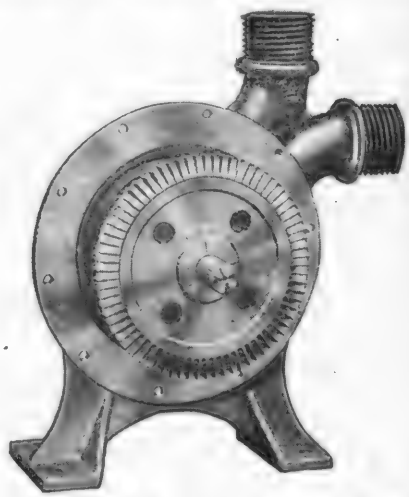


FIG. 1.—IMPELLOR AND CASING OF TRANE MASTER PUMP.

construction, the manufacturers state that its design is the result of delicate adjustment of the factors of speed, diameter of impellor, size of channel, shape, depth and number of pockets. The pump has a heavy cast-iron body, fitted with brass bearings. The impellor is of brass, machined throughout and balanced.

The outfit consists of a cast-iron receiver of 10-gal. capacity, elliptical in shape, allowing for a long, powerful float arm on the inside. The float is connected by levers to a float switch on the outside of the receiver. The pump and motor, which are mounted on a single cast-iron base with the receiving tank, are connected by a flexible coupling. General electric motors are used for all sizes.

In a circular describing the Trane master pump, capacities and other information are given for the four different types comprising this line. In the same connection some hints are given on the selection of the proper type. For example, if no pressure reducing valve is used and the heating plant is operating on full boiler pressure, the A or B pump is recommended. Where there is a pressure-reducing valve, usually the C or D type must be selected. As a matter of economy the company furnishes only one size receiving tank and recommends that in all cases where there is over 3000 sq. ft. of radiation, a 20-gal. or 30-gal. steel tank be connected in parallel with the receiver. The capacities of the pumps run from 10 gal. per minute to 1000 gal. per minute or even larger.

These circulation pumping units are also arranged for turbine, engine or belt drive.

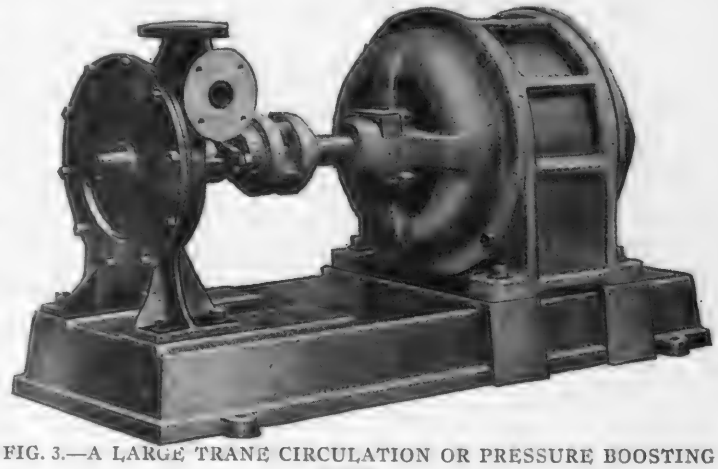


FIG. 3.—A LARGE TRANE CIRCULATION OR PRESSURE BOOSTING UNIT.

FIG. 2.—TRANE MASTER PUMP CONNECTED WITH RECEIVER.

New Publications.

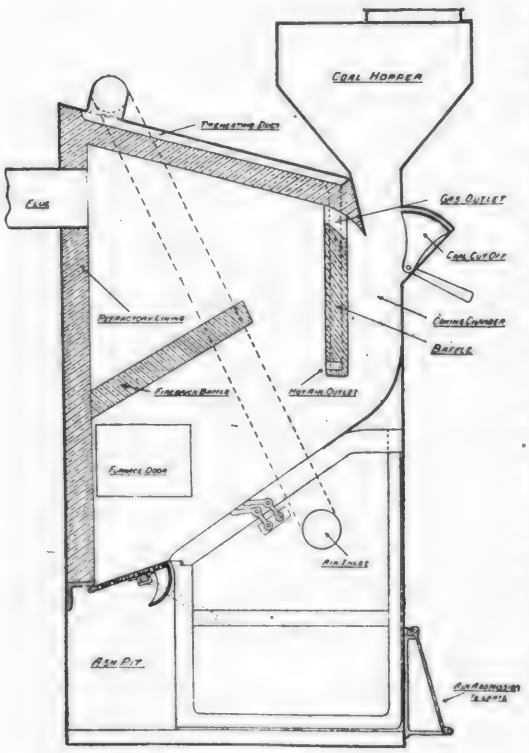
CHEMISTRY IN OVERALLS is the title of a readable booklet devoted to the industrial research laboratories of Arthur D. Little, Inc., Boston, Mass. This organization, which is the result of more than 30 years' experience in the application of science to industry, has recently occupied its new laboratory building, which is described as a factory in miniature where the many and various problems that arise in the modern arts of production may be studied. The booklet is replete with views of the different rooms and sections of the building, all of which are shown equipped with the latest types of analytical and experimental apparatus. Under "What We Do," the company states that it solves problems in manufacture, engages in industrial research and makes chemical analyses. The company also manages corpora-

tions enegaged in chemical manufacture, and develop methods and processes, including the design of apparatus, the construction of works and the systematizing of manufacture in them. The booklet then proceeds to give typical instances of the company's work from a study of the chrome tanning of leather to the development of a waterproof paper. Size 6 x 9 in. (standard). Pp. 36.

SAVING COAL IN BOILER PLANTS, by Henry Kreisinger, is one of the latest publications of the Bureau of Mines (Technical Paper 205). The paper is described as covering the field between two other Bureau of Mines publications, Technical Paper 80 on "Hand Firing Soft Coal Under Power-Plant Boilers," and Bulletin 97 on "Sampling and Analysis of Flue Gases." The present bulletin is written for the fireman, the engineer and the owner of the small or medium-size plant which is, as a rule, hand-fired. Size 6 x 9 in. (standard). Pp. 24.

Trade Literature.

DEVINE APPARATUS FOR THE CHEMICAL AND ALLIED INDUSTRIES is the subject of a booklet issued by the J. P. Devine Co., Buffalo, N. Y., whose apparatus for drying fruits and vegetables by the vacuum method was described at the last summer meeting of the heating engineers' society. Illustrated descriptions are given of the Devine vacuum pans for the concentration of sugar juice, milk, etc., and of the Devine vacuum evaporators, built in single and multiple effect. The booklet concludes with an illustration of the company's experimental laboratory in Buffalo. Size 4¼ x 5½ in. Pp. 32.



DOMESTIC LIGNITE HEATER.

DOMESTIC LIGNITE FURNACE is a new type of heater brought out by R. D. McLaurin, of the University of Saskatchewan, Saskatoon, Canada, and described in newly-issued circular matter. One of the heaters was exhibited in operation at the recent chemical exposition in New York. The essential features of the furnace include a carbonizing chamber, a combustion chamber, means for directing the course of the hot gases, inclined shutter gate so constructed that screenings and dust are prevented from escaping into the ashpit, dumping grate so constructed that ash may be dumped while live coal is retained on the inclined grate, and coal hopper of sufficient capacity to keep the furnace operating 24 hours on two charges. It is claimed that by this design complete combustion of volatile matter is obtained. The feed is automatic.

PATTERSON HOT-WATER SERVICE HEATERS, made by the Patterson-Kelley Co., New York, are presented in a well-prepared catalogue recently issued by this company. The fact that the company's experience as water heating engineers extends over a period of 30 years lends special interest to the latest developments in its line of hot-water service heaters and convertors. Each type, for instance, has been brought out to meet certain requirements of service and may be used with exhaust steam or live steam in connection with low-pressure, vacuum or vapor heating systems. In addition to the designs shown the illustrations include a typical installation showing how a Patterson hot-water service heater and storage tank may be supplied with steam from a low-pressure boiler during the heating season, the condensation returning by gravity. It is cross-connected to a hot-water boiler, for which it furnishes storage capacity when the heating boiler is not in use. This illustration also shows how the temperature regulator may be used to control the admission of steam to the heater and to operate the damper on the hot-water boiler. Detailed capacity tables for the various sizes and types are included, the catalogue closing with two pages of data on the Patterson-Berryman feed-water heater and purifier. Size 6 x 9 in. (standard). Pp. 32.

MEMBERS OF THE TRADE PRESS AT THE DINNER OF THE ASSOCIATED BUSINESS PAPERS, INC., HOTEL ASTOR, NEW YORK, OCTOBER 21, 1918.

Copyright by Committee on Public Information.

A LINK IN THE "BRIDGE TO PERSHING."

America's New Merchant Marine.

This merchant ship is almost ready to leave our shores filled to overflowing with supplies for our Allies and our army in France, paid for by the money the government receives in exchange for Liberty Bonds.

It is typical of one class of ship being turned out by the Emergency Fleet Corporation.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at Cooperstown, N. Y., for October 1, 1918.

County of New York, }
State of New York. } ss.

Before me, a notary public in and for the State aforesaid, personally appeared A. S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the Editor of THE HEATING AND VENTILATING MAGAZINE, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.
Editor, A. S. Armagnac, 1123 Broadway, New York, N. Y.
Managing Editor, None.
Business Manager, Gustave Petersen, 1123 Broadway, New York, N. Y.

2. That the owners are. (Give names and addresses of individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)
Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.
A. S. Armagnac, 1123 Broadway, New York, N. Y.
Gustave Petersen, 1123 Broadway, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not apear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona-fide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

A. S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 24th day of September, 1918.

A. C. Hagarty,
Notary Public, Kings County, No. 131.
Cert. filed in N. Y. County,
County Clerk's No. 316.
(My term expires March 30, 1920.)

EQUIVALENT INSIDE TEMPERATURE FOR DIRECT RADIATION.

The question is often raised as to what temperature would be maintained inside of a building with a direct heating system which would give 70° F. when it is zero outside or any other arbitrarily assumed temperatures. Table I covers this matter in an unusually complete form.

In using Table I the factor at the bottom of each column is of great importance being the *number of degrees additional* which will be realized in the *indoor* temperature for *each degree* the outside temperature is *above* the *specified* temperature.

Example:—A given job is specified to heat to 70° F. in zero weather with 5 lbs. steam on. At time of test it is 20° F. outside (average) and steam is at 3 lbs. What will the resultant inside temperature if the apparatus is large enough to fulfil the specified conditions?

The figures in Table I are the resulting temperatures with the outside at *zero* and the steam pressure varied. Thus, in the above case, if the outside were zero and the temperature inside 70° with 5 lbs. of steam, with 3 lbs., by the table, it would be 68.3° F. But with the outside temperature 20° above, the "factor" of 0.692 at the bottom of the column must be multiplied by 20 and this result *added* to the temperature *given by the table.*

Thus:— 0.692 x 20 = 13.84° correction for outside 20°
68.30 temperature for corrected steam pressure and zero

82.14° resultant inside temperature.

TABLE 1.

Actual Steam Pressure Under Test	Corresponding Steam Temperature	Steam Pressure To Be Used Under Specification. Pressure, Pounds Gauge.										
Vacuum In.	Degrees F.	0	1	2	3	4	5	6	7	8	9	10
10	192	63.3	62.3									
9	194.5	64.2	63.2	62.3								
8	197	65	64	63	62.2							
7	199	65.6	64.7	63.7	62.8	62						
6	201	66.3	65.3	64.3	63.4	62.6	62					
5	203	67	66	65	64	63.3	62.6	61.9				
4	205	67.6	66.6	65.6	64.7	63.9	63.2	62.5	61.7			
3	207	68.3	67.2	66.2	65.3	64.5	63.8	63.1	62.3	61.7		
2	208.5	68.8	67.7	66.7	65.7	65	64.2	63.6	62.8	62	61.5	
1	210.5	69.4	68.3	67.5	66.4	65.6	64.8	64.2	63.3	62.6	62.1	61.5
Gauge Lbs.												
0	212	70	68.8	67.8	66.9	66.1	65.3	64.6	63.8	63.1	62.6	62
1	215.5	71.2	70	69	68	67.2	66.3	65.8	65	64.2	63.7	63
2	218.7	72.1	71	70	69.2	68.2	67.3	66.7	65.9	65.1	64.5	64
3	221.7		72	71	70	69.2	68.3	67.6	66.7	66	65.4	64.8
4	224.5			71.8	70.8	70	69.2	68.4	67.5	66.7	66.2	65.7
5	227.2				71.7	70.8	70	69.2	68.3	67.6	67	66.3
6	229.8					71.7	70.8	70	69.2	68.4	67.7	67.2
7	232.4						71.7	70.9	70	69.2	68.6	68
8	234.9							71.7	70.8	70	69.3	68.7
9	237.3								71.5	70.5	70	69.3
10	239.4									71.3	70.7	70
Factors for each degree outside temperature varies from specified temperature		0.67	0.675	0.678	0.684	0.688	0.692	0.694	0.698	0.702	0.705	0.707

RULES FOR FLANGED FITTINGS.

AMERICAN 1915 STANDARD, EXTRA HEAVY.

1. Extra heavy reducing elbows carry same dimensions center to face as regular elbows of largest straight size.

2. Extra heavy tees, crosses and laterals, reducing on run only, carry same dimensions face to face as largest straight size.

3. Where long turn fittings are specified, it has reference only to elbows which are made in two center to face dimensions and to be known as elbows and long-turn elbows, the latter being used only when so specified.

4. Extra heavy fittings must be guaranteed for 250 lbs. working pressure, and each fitting must have some mark cast on it indicating the maker and guaranteed working steam pressure.

5. All extra heavy fittings and flanges to have a raised surface 1/16-in. high inside of bolt holes for gaskets. Thickness of flanges and center to face dimensions of fittings include this raised surfaced. Bolt holes to be ⅛-in. larger in diameter than bolts. Bolt holes to straddle center lines.

6. Size of all fittings scheduled indicates inside diameter of ports.

7. Square head bolts with hexagonal nuts are generally recommended for use.

8. Double branch elbows, side outlet elbows and side outlet tees, whether straight or reducing sizes, carry same dimensions center to face and face to face as regular tees and elbows.

9. Bull head tees or tees increasing on outlet, will have same center-to-face and face-to-face dimensions as a straight fitting of the size of the outlet.

10. Tees, crosses and laterals 16-in. and smaller, reducing on the outlet, use the same dimensions as straight size of the larger port. Sizes 18-in. and larger, reducing on the outlet, are made in two lengths, depending on the size of the outlet as given in the table of dimensions.

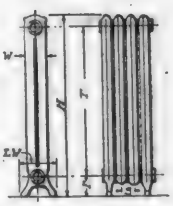
11. For fittings reducing on the run only a long body pattern will be used. Y's are special and made to suit connections. Double branch elbows are not made reducing on the run.

12. Steel flanges, fittings and valves are recommended for superheated steam.

KEWANEE BOILER COMPANY'S 1-COLUMN KEWANEE RADIATORS FOR STEAM AND WATER.

HEATING SURFACE, SQUARE FEET

Number of Sections	Length Inches	38 Inches High. 3 Square Feet per Section	32 Inches High. 2½ Square Feet per Section	26 Inches High. 2 Square Feet per Section	23 Inches High. 1¾ Square Feet per Section	20 Inches High. 1½ Square Feet per Section
2	5	6	5	4	3½	3
3	7½	9	7½	6	5	4½
4	10	12	10	8	6⅔	6
5	12½	15	12½	10	8⅓	7½
6	15	18	15	12	10	9
7	17½	21	17½	14	11⅔	10½
8	20	24	20	16	13⅓	12
9	22½	27	22½	18	15	13½
10	25	30	25	20	16⅔	15
11	27½	33	27½	22	18⅓	16½
12	30	36	30	24	20	18
13	32½	39	32½	26	21⅔	19½
14	35	42	35	28	23⅓	21
15	37½	45	37½	30	25	22½
16	40	48	40	32	26⅔	24
17	42½	51	42½	34	28⅓	25½
18	45	54	45	36	30	27
19	47½	57	47½	38	31⅔	28½
20	50	60	50	40	33⅓	30
21	52½	63	52½	42	35	31½
22	55	66	55	44	36⅔	33
23	57½	69	57½	46	38⅓	34½
24	60	72	60	48	40	36
25	62½	75	62½	50	41⅔	37½
26	65	78	65	52	43⅓	39
27	67½	81	67½	54	45	40½
28	70	84	70	56	46⅔	42
29	72½	87	72½	58	48⅓	43½
30	75	90	75	60	50	45
31	77½	93	77½	62	51⅔	46½
32	80	96	80	64	53⅓	48



Note—Add 1/2 in. for each bushing to get total length of radiator.
H — Total overall height.
T — C. to C. of tappings.
F — Floor to center of bottom tapping.
W — Width of radiator—4 1/2 in.
LW — Width of radiator legs—4 1/2 in.
S — Width of radiator sections—i. e., c. to c. of sections, or 2 1/2 in.

Nominal Height of Radiator In.	Actual Height H In.	For one-pipe steam and return on two-pipe steam F In.	T In.	For two-pipe steam supply and hot water supply and return F In.	T In.
38	38	4	31 1/2	4 1/2	31
32	32	4	25 1/2	4 1/2	25
26	26	4	19 1/2	4 1/2	19
23	23	4	16 1/2	4 1/2	16
20	20	4	13 1/2	4 1/2	13

For high legs add 1 1/2 in. to H. and F.
For legless radiators deduct 2 1/4 in. from H. and F.

TAPPING DATA

All radiators are regularly tapped 1 1/2 in. and bushed as follows:
When top tapping is required it can be furnished either 1 1/2 in. and bushed or tapped solid any size smaller than 1 1/2 in.

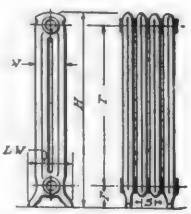
SYSTEM	Size of Radiator Square Feet	Supply In. Diam.	Return In. Diam.
Steam, one-pipe	Up to 24, inc.	1	
	Over 24 up to 60 inc.	1 1/4	
	Over 60 up to 100 inc.	1 1/2	
	Over 100	2	
Steam, two-pipe	Up to 48 inc.	1	3/4
	Over 48 up to 96, inc.	1 1/4	1
	Over 96	1 1/2	1 1/4
Water	Up to 42, inc.	1	1
	Over 42 up to 72, inc.	1 1/4	1 1/4
	Over 72	1 1/2	1 1/2

Air valve tappings are 1/8 in.
Vapor tappings are special.
All tappings with R. H. threads.

KEWANEE BOILER COMPANY'S 2-COLUMN KEWANEE RADIATORS FOR STEAM AND WATER.

HEATING SURFACE, SQUARE FEET

Number of Sections	Length, Inches	45 Inches High, 5 Square Feet per Section	38 Inches High, 4 Square Feet per Section	32 Inches High, 3½ Square Feet per Section	26 Inches High, 2¾ Square Feet per Section	23 Inches High, 2½ Square Feet per Section	20 Inches High, 2 Square Feet per Section
2	5	10	8	6⅞	5½	4⅝	4
3	7½	15	12	10	8	7	6
4	10	20	16	13⅛	10⅞	9⅛	8
5	12½	25	20	16⅞	13½	11⅜	10
6	15	30	24	20	16	14	12
7	17½	35	28	23⅛	18⅞	16⅜	14
8	20	40	32	26⅝	21½	18⅝	16
9	22½	45	36	30	24	21	18
10	25	50	40	33⅛	26⅞	23½	20
11	27½	55	44	36⅝	29½	25⅝	22
12	30	60	48	40	32	28	24
13	32½	65	52	43⅛	34⅞	30⅛	26
14	35	70	56	46⅝	37½	32⅝	28
15	37½	75	60	50	40	35	30
16	40	80	64	53⅛	42⅞	37⅜	32
17	42½	85	68	56⅝	45½	39⅝	34
18	45	90	72	60	48	42	36
19	47½	95	76	63⅛	50⅞	44⅛	38
20	50	100	80	66⅝	53½	46⅝	40
21	52½	105	84	70	56	49	42
22	55	110	88	73⅛	58⅞	51⅛	44
23	57½	115	92	76⅝	61½	53⅝	46
24	60	120	96	80	64	56	48
25	62½	125	100	83⅛	66⅞	58⅛	50
26	65	130	104	86⅝	69½	60⅝	52
27	67½	135	108	90	72	63	54
28	70	140	112	93⅛	74⅞	65⅛	56
29	72½	145	116	96⅝	77½	67⅝	58
30	75	150	120	100	80	70	60
31	77½	155	124	103⅛	82⅞	72⅛	62
32	80	160	128	106⅝	85½	74⅝	64



Note—Add 1/2 in. for each bushing to get total length of radiator.
H — Total overall height.
T — C. to C. of tappings.
F — Floor to center of bottom tappings.
W — Width of radiator—7 1/2 in.
LW — Width of radiator legs—7 1/2 in.
S — Width of radiator sections—i. e., c. to c. of sections, or 2 1/2 in.

Nominal Height of Radiator In.	Actual Height H In.	For one-pipe steam and return on two-pipe steam F In.	For one-pipe steam and return on two-pipe steam T In.	For two-pipe steam supply and hot water supply and return F In.	For two-pipe steam supply and hot water supply and return T In.
45	45	4	38 1/2	4 1/2	38
38	38	4	31 1/2	4 1/2	31
32	32	4	25 1/2	4 1/2	25
26	26	4	19 1/2	4 1/2	19
23	23	4	16 1/2	4 1/2	16
20	20	4	13 1/2	4 1/2	13

For high legs add 1 1/2 in. to H. and F.
For legless radiators deduct 2 1/4 in. from H. and F.

TAPPING DATA

All radiators are regularly tapped 2 in. and bushed as follows:
When top tapping is required it can be furnished either 1 1/2 in. and bushed or tapped solid any size smaller than 1 1/2 in.

SYSTEM	Size of Radiator Square Feet	Supply In. Diam.	Return In. Diam.
Steam, one-pipe	Up to 24 inc.	1	
	Over 24, up to 60, inc.	1 1/4	
	Over 60 up to 100, inc.	2 1/2	
	Over 100.		
Steam, two-pipe	Up to 48, inc.	1	3/4
	Over 48 up to 96, inc.	1 1/4	1
	Over 96.	1 1/2	1 1/4
Water	Up to 42, inc.	1	1
	Over 42 up to 72, inc.	1 1/4	1 1/4
	Over 72	1 1/2	1 1/2

Air valve tappings are 1/8 in.
Vapor tappings are special.
All tappings with R. H. threads.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

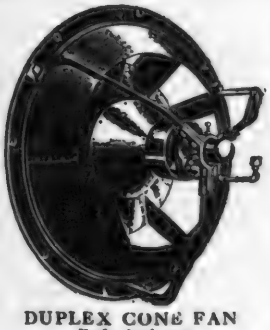
Excelsior Steel Furnace Co., Chicago, Ill., has prepared an elaborate heating chart designed to assist in the economical operation of heaters of all kinds. In connection with the chart the company calls attention to what it considers an error in the recently-compiled rules of the United States Fuel Administration which, the company states, would shorten the life of the apparatus and cause great loss to the owner. The statement in question is that the cold-air supply of warm-air furnaces should equal one-half of the area of the warm-air pipes, whereas the two should be equal, with inside circulation. The company has called this matter to the attention of the Cook County division of the Fuel Administration.

American Peat Society held its annual meeting in New York, September 25-27, last. New interest in the possibilities of peat has been created by the fuel situation. Peat as a source of fuel and its value for agricultural purposes were the principal topics of discussion.

"Made in U. S. A." has been recommended by the Mercants' Association of New York as designation that should be used in plain type form by all of its members on all goods manufactured by them in the United States and that the use of all other markings to identify the country of origin of such goods should be discontinued.

Central Supply Association has postponed its meetings until further notice on account of the prevailing health conditions. This action was taken on the advice of the Chicago health authorities.

Charles F. Newport, secretary and treasurer of the Newport Boiler Co., Chicago,



DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE
45 FULTON ST., N. Y.
Ventilating Engineers and Contractors
MANUFACTURERS OF
BLACKMAN and DUPLEX CONE FANS
which are installed by us complete with **Motors, Duct Work** and **Wiring.**

Aligning, Rigging and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations.

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.

SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

Ill., is engaged on engineering work for the government in Toledo, O., in connection with the power plant and heating system for the new $20,000,000 nitrate plant being built near that city.

Harold L. Alt, well known as a heating and ventilating and as a contributor to the pages of THE HEATING AND VENTILATING MAGAZINE and other journals, has been appointed China representative of Andersen, Meyer & Co., engineers, of New York. Mr. Alt will be stationed at Shanghai, China. He sailed for his new post early in November and his present plans call for a stay there of at least three years.

New Building Operations announced by *The American Contractor* include the following:

$5,000,000 manufacturing plant, Cumberland, Md., The American Cellulose & Chemical Co.

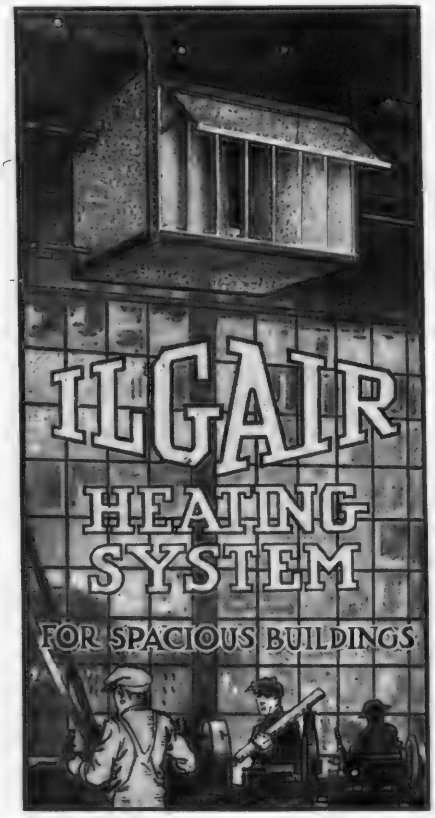
$2,000,000 industrial housing (600 houses) Philadelphia, Pa., United States Emergency Fleet Corporation.

$600,000 hotel and apartment building, Washington, D. C., Simons & Kratkoff.

$600,000 mill additions, Medford, Mass., American Woolen Co.

$100,000 motion picture theater, Cleveland, O., Wall Theater Co.

The following are contemplated:



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Offer a new method of heating big spaces

The installation is simple
First cost is low
Installation can be made very quickly
Power consumption very low
System has great flexibility
As good for cooling in summer as for heating in winter

Ideal for heating new war plants with rush orders

Very quick shipments for direct or indirect government work

Write for descriptive bulletin

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158 WHITING ST., CHICAGO, ILL.
Branches—All Large Cities

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

DETROIT PACKLESS RADIATOR VALVES

The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.

DETROIT PACKLESS
Vacu Valve showing Dial Plate and Lever Handle

Booklet VP-1 Gladly Sent Upon Request

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

GORTON QUICK VALVE OPENING

Would you use a door knob that required five or six turns of the wrist to open a door?

Then why use a valve that requires nine or ten turns of the wrist to operate?

A quarter turn of the wrist opens or closes the Gorton Valve.

This makes it easy to operate the valve and radiators will then be shut off when heat is not required, and that means

Saving Coal

It is a valve that is made tight and stays tight.

Write for Catalogue telling how it is done.

See SWEET'S CATALOGUE for Specifications

GORTON & LIDGERWOOD CO.

100 Liberty Street

New York, N. Y.

$500,000 factory additions, Detroit, Mich., Dodge Brothers, Inc.

$400,000 shipbuilding plant, Kewaunee, Wis., Wisconsin Shipbuilding Co.

$250,000 storage building, Swift & Co., Chicago.

$150,000 canning factory, packing house and storage house, Newport, N. J., Staden Cosier Co.

$100.000 bakery additions, Pittsburgh, Pa., Liberty Baking Co.

Plans have been drawn for the following:

$100,000 apartment (21 families), Newark, N. J., Joseph Bell.

Among the contracts let for government work are the following:

$1,000,000 hospital buildings, Wards Island, N. Y.

American Society of Mechanical Engineers has established a section in Cleveland known as "the Mechanical Section of the Cleveland Engineering Society." The petition for this section was made jointly by members of the local society and by members of the national society resident in Cleveland. This new section comprises several of the surrounding cities, including Akron and Sandusky, with a total membership of 260.

American Public Health Association has postponed the date of its annual meeting to December 9-12, 1918. Headquarters will be at the Hotel Morrison. The postponement was caused by the fact that so many speakers and delegates from the east were unable to leave their posts. The action also conforms with the urgent request of Surgeon-General Rupert Blue of the U. S. Public Health Service.

Eastern Supply Association held its annual meeting in New York, October 9. Headquarters were at the Hotel Astor. The morning speakers included William Smedley, field secretary of the Retail Hardware Merchants' Association of Pennsylvania, who gave a forceful talk on "Organization;" and

Braemer

Air Conditioning Corporation

Air Purifying—Air Cooling—Humidifying—Dehumidifying—Industrial Ventilation—High and Low Temperature Drying—Generator Coolers—Dust Removal—Reclamation.

Webster Air Washers

LAFAYETTE BLDG.
PHILADELPHIA

G. A. O'Reilly, trade .representative of the Irving National Bank, who spoke on "Trade Acceptances." One of the important actions taken was the granting of an appropriation of $1,000 to the Trade Extension Committee. At the afternoon session the speakers were Dr. Charles A. Eaton, whose subject was "In Uncle Sam's Shipyards;" Theodore Ahrens, president of the Standard Sanitary Mfg. Co., who compared jobbing conditions of this year and last, Frank Torrance, vice-president of the Standard Sanitary Mfg. Co., and George D. McIlvaine, secretary of the National Pipe and Supplies Association. Mr. McIlvaine stated, among other things, that the demands of the government on account of the war are more than the potential possibilities of the country's output. He said it was time for every business man to eliminate the personal factor. "It is not only the duty," he declared, "of the jobbers to notify the government where every 5,000 tons of iron or steel is located, but it is their duty to notify the government of every ton and to see to it that it is not diverted from essential uses." New officers were elected as follows: President, Joseph F. Evans, Wilkes-Barre, Pa.; first vice-president, A. M. Maddock, Trenton, N. J.; second vice-president, James F. Conran, Pittsburgh, Pa.; treasurer, Martin Behrer, New York; Secre-

Johns-Manville Radiator Trap

THE EXACT cost of material and labor plus a definite profit for you—that is your bid on a trap installation job when you use Johns-Manville Traps. There is no guesswork to it.

We give you the price you are rightly entitled to and the simplicity of the trap insures you a profit on the installation.

This Johns-Manville Trap is installed in record time—and once installed, you are through—no call-backs for adjustments or repairs. This trap doesn't jam, stick or air-bind—it works. Ask any Johns-Manville salesman to show you one.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

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It is more than a catalog—it is a text book on Instruments for Indicating and Reading Pressure, Vacuum Draft, Temperature, etc.

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tary, Frank S. Hanley, New York; Directors —P. J. Faherty, Lambertville, N. J.; C. W. Fell, Buffalo, N. Y.; Frank W. Hubbard, Boston, Mass.; George E. Keenan, Bayonne, N. J.; John A. Murray, New York; F. T. Stevens, Haydenville, Mass.; A. A. Tomlinson, Norfolk, Va. Representatives to the National Committee of the Confederated Supply Associations—John A. Murray, De Witt Cook, A. B. McLeod, James A. Messer and H. W. Thorndike. Councilor to the Chamber of Commerce of U. S., Guilford R. Adams.

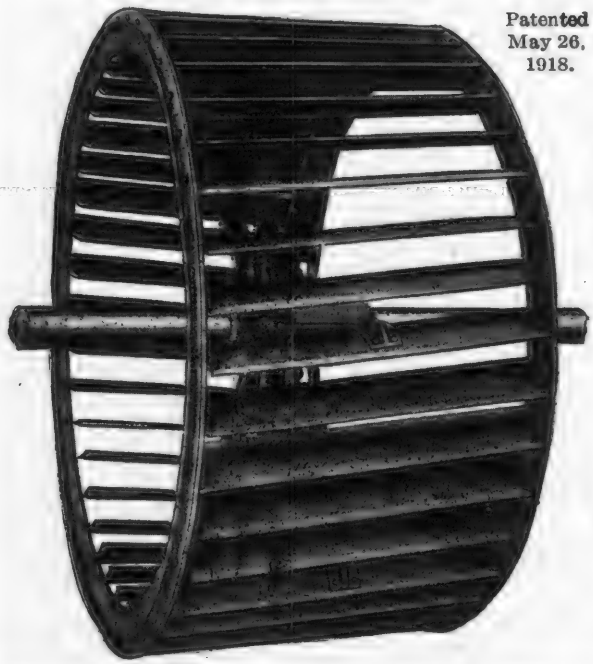
Chicago, Ill.—Health Commissioner Robertson has served notice on practically all of the churches in Chicago that any church building in the city that is found to be poorly ventilated will be closed. This action is taken on account of the eidemic of Spanish influenza and pneumonia. Similar action was taken in connection with the schools, theatres, restaurants and surface and elevated cars. The entire police department of Chicago was assigned to the task under special orders issued by Acting Chief Alcock. "Commanding officers," read the order, "will instruct all members of their command to visit all public places such as theaters, moving picture shows, halls, saloons, restaurants, cafés, drug stores, poolrooms, ice cream parlors, and other places where people congregate and request the proprietors to urge their patrons to aid in the work of mutual protection." Acting upon the request of Commissioner Robertson, Chief Alcock also issued an order for the closing of a moving picture theater at 618 South State street.

American Society of Mechanical Engineers. announces the indefinite postponement of the Indianapolis meeting of the council and mid-western sections, scheduled for October 25-26. The cause of the postponement is the prevailing epidemic of Spanish influenza.

Central Supply Association announces that the jobbers' convention scheduled for October 30-31, in Pittsburgh, was called off by order of the Pennsylvania health authorities. The same ruling applied to the scheduled meeting of the Central Supply Association, which was to have met in Pittsburgh, on October 29. It will now meet in Chicago November 20 at the Hotel Sherman.

Building Permits for September, 1918, totaled $35,431,137, as compared with $50,724,143 for the corresponding month last year. In connection with the detailed tabulation published by the *American Contractor*,

THE NEW IMPROVED **Cycloidal Multivane Wheel**



Patented May 26, 1918.

For Heating and Ventilating

The vanes are curved forward, and set at an angle to the shaft, (patented feature) allowing uniform, unrestricted flow of air across entire width of wheel.

Highest Efficiency

Noiseless and Durable

Write for further details

Garden City Fan Co.
Est. 1879
CHICAGO, ILL.
Eastern Representatives:
L. J. WING MFG. CO., New York

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Sirocco"

TRADE MARK

Speeds Up Production

In these days of rush work, with everything strained to the limit, fresh pure air for the factory is of vital importance.

The Sirocco System of Heating and Ventilating is used by many of America's best known and most successful manufacturers.

The view above shows an installation in a factory noted for its production and efficiency methods.

In the "dog days" of summer the Sirocco System is invaluable in keeping the factory workers fresh and fit by supplying the proper amount of fresh, pure air to every nook and corner.

Let us tell you more about Sirocco for your factory—Ask for Bulletin No. 270.

American Blower Company

DETROIT, MICHIGAN

BRANCHES IN ALL PRINCIPAL CITIES

Chicago, it is pointed out that the operations for the last half of September came under the ban of the War Industries Board. The compilation covers the activities in 133 cities. The large cities showing gains were Atlanta, Baltimore, Birmingham, Dayton, Des Moines, Detroit, Duluth, Erie, Oakland, Portland, Ore.; Richmond, Seattle, Tacoma, Waterbury and Youngstown. In Huntington, W. Va., the figures were $547,510 as compared with $85,480 for September, 1917. Detroit showed up well, with a total of $2,657,420 as compared with $2,030,650 for the corresponding month last year. Seattle made a fine showing with a total of $1,402,510 as compared with $441,800, while Youngstown's increase was 134%, from $287,040 to $671,860. The most notable losses were those reported by Boston (65%), Buffalo (54%), Chicago (43%), Cincinnati (73%), Cleveland (52%), Memphis (88%), Minneapolis (53%), New York (52%), and St. Louis (64%).

Central Station Heating Notes.

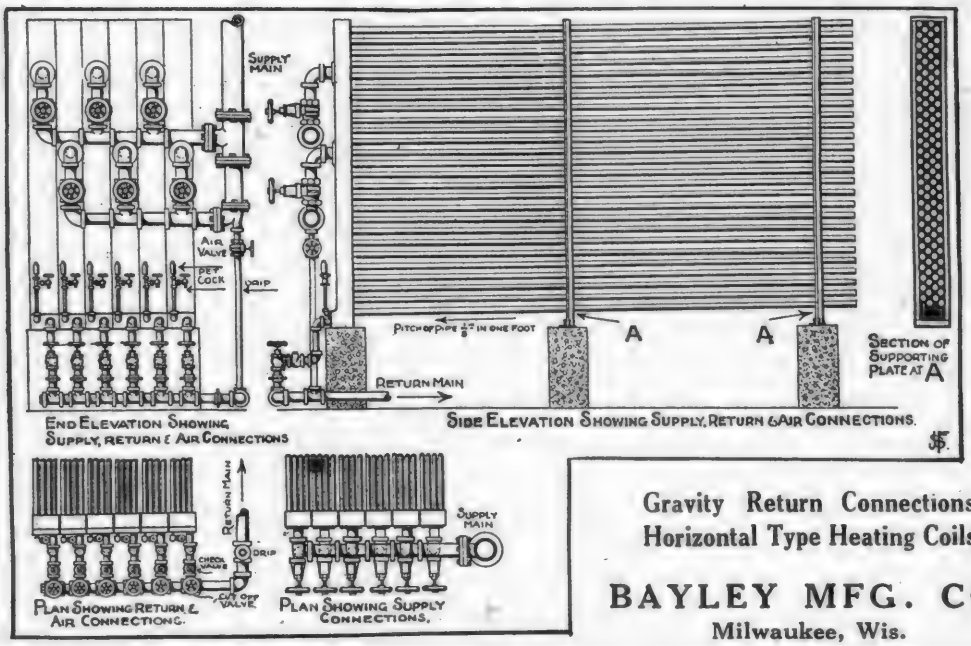
St. Joseph, Mo.—The local street railway has been served with a writ of mandamus directing it to turn on steam for heating residence property on Robidoux Street. This is a test case affecting a number of property owners in the district just north of the courthouse where certain residences have been supplied with steam heat by the company for twenty years. Recently these consumers were notified by the company that the service would be discontinued. According to J. H. Van Brunt, general manager of the company, it is very difficult to get steam into that district and inasmuch as the houses heretofore supplied have furnaces it was thought that it would be no hardship on the owners to shut off the steam.

Belvidere, Ill.—Patrons of the Illinois Northern Company's heating service have agreed that the company is entitled to a reasonable advance in its rates, but will oppose any extraordinary increase or any new method of figuring radiation. The patrons will also oppose the company's new application to abandon the plant at the close of the present heating season. The company had previously proposed to abandon the plant and at that time the commission was told that the patrons would be willing to pay higher rates to cover the increased costs of operation.

Paris, Ill.—Failure on the part of those in charge of the central heating plant in Paris to begin operation has disclosed the fact that the company's contract calls for "heat during the heating season," neither the temperature nor the time being specified.

CHINOOK HEATERS

Give Positive Circulation No Unequal Expansion and Contraction. Highly Efficient



Gravity Return Connections
Horizontal Type Heating Coils

BAYLEY MFG. CO.
Milwaukee, Wis.

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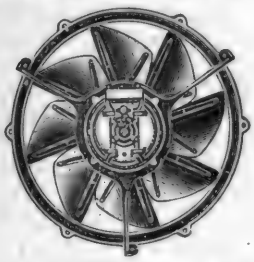
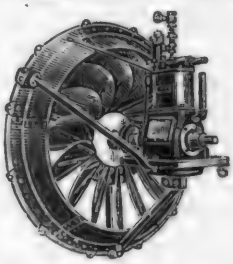
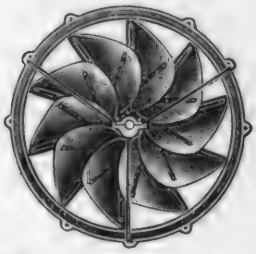
JAMES M. SEYMOUR

NEWARK - NEW JERSEY - U. S. A.

ELECTRIC DRIVEN STEAM DRIVEN BELT DRIVEN

Send for Bulletin No. 121, Jan. 1917

SEYMOUR FANS are the most durable and efficient air moving machines to be had in this country. Built in seven styles and fifteen sizes, 18-inch to 168-inch fans in stock. Capacity 1000 cubic feet to 150,000 cubic feet per minute.

Ventilating systems to suit all conditions. **Dust Collectors, Humidifiers, Dry-Rooms** to dry anything from bricks to sponges.

AIR CONDITIONING

JAMES M. SEYMOUR, 5-7-9-11-15-17-19 Kirk Place, NEWARK, N. J.

AUTOVENT Motor Driven Propeller Fans

AUTOVENT fan motors are ventilated through a mechanical process of radial heat convection created by the operation of the fan wheel together with the motor in which the motor temperature is carried away with the general exhaust of the fan wheel. This feature affords the motor to operate under ventilated conditions yet protecting same against foreign substances entering therein.

AUTOVENT fans are specially designed and particularly adaptable to handling steam, moisture, and acid fumes, because the motors are of the protective autovent type.

AUTOVENT fan motors reach the highest point in motor efficiency.

AUTOVENT fans have and will always make good for you because they are built on merit.

PROTECTED TYPE MOTOR

Manufactured by

BATTERMAN TRUITT CO.

736-38 W. Monroe Street

CHICAGO, ILL.

Cleveland Office: 919 American Trust Bldg.

Philadelphia Office: W. I. Cheyney, Heed Bldg.

Kewanee, Ill.—The Illinois Public Utilities Commission has handed down a decision on the application of the Consolidated Light and Power Company in Kewanee, granting a flat rate of 60 cents per 1000 lbs., with a discount of 10% for prompt payment, to be effective on and after September 15, 1918. With the discount off the new rate is 4c in advance of the highest rate on the old sliding schedule which was 50 cents per 1000 lbs. for the first 20,000 lbs. of steam. The minimum charge under the new rate is $3.00 per month on buildings containing 20,000 cu. ft. or less of floor space and 15c for each additional 1000 cu. ft. of floor space. The new rate as specified by the commission is temporary, in that it is subject to change at any time by the commission. Previous decisions bound the conrtact for a period of two years or more but the new rate is subject to change within a reasonable time after notification.

The rates previously charged were as follows:

50c per 1000 lbs for the first 20,000.
45c per 1000 lbs. for the next 20,000.
40c per 1000 lbs. for the next 60,000.
35c for all over 100,000 lbs., all with a discount of 5% for prompt payment.

Taylorville, Ill.—A serious situation was narrowly averted in Taylorville at the opening of the heating season when the company refused to turn on steam heat which is connected to the East Side School building, as well as to many business houses and homes in Taylorville. The company based its action on the failure of its patrons to make a settlement on the overplus on the meter charges over the old flat-rate charges, amounting in all to a matter of $10,000. The consumers claimed that the company had entered into

The "Curve" of Humidity almost a "Straight Line"

During a recent excessive hot spell a test was made at Holyoke, Massachusetts, in a mill equipped with Carrier System of Humidifying with Automatic Control. Humidity varied only between 63 and 67 per cent and when plotted the "curve" was practically a "straight line."

The Carrier organization will be glad to co-operate with Heating and Ventilating Engineers.

Carrier Engineering Corporation

39 Cortlandt Street, New York

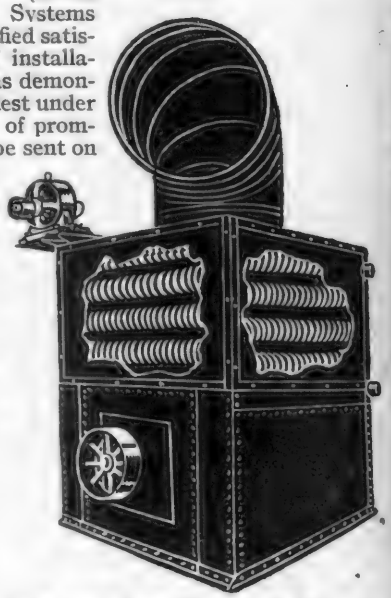
Boston Philadelphia Buffalo Chicago

89

SKINNER BROS. -BAETZ PATENT- HEATING SYSTEM

Most Efficient and Economical

SKINNER BROS. (Baetz Patent) Heating Systems are giving unqualified satisfaction in hundreds of installations. Practical use has demonstrated they meet the test under all conditions. Names of prominent users will gladly be sent on request.



Save Money, Fuel and Floor Space

Each heater is a separate and complete unit—simple, substantial, easily accommodated to your present floor arrangements. Heaters contain a series of enclosed steam coils operating in connection with a powerful air fan which circulates the air direct to all parts of the room. No draft—no conducting pipes—only the directing elbow as shown in the illustration. Uses exhaust or live steam. Heats—ventilates—and quickly clears the air of steam and vapors. Always ready—always on the job—lowest in repair expense.

Sold Under Positive Guarantee

Try it in your own plant. Judge it for yourself. Engineer's estimate upon your individual requirements gladly furnished. Write today for illustrated booklet of specifications and testimonials of users.

SKINNER BROS. MFG. CO.

1016 Tyler St. St. Louis, U. S. A.

The more difficult or unusual your heating problem, the more desirous we are to show you how easily and economically it can be solved.

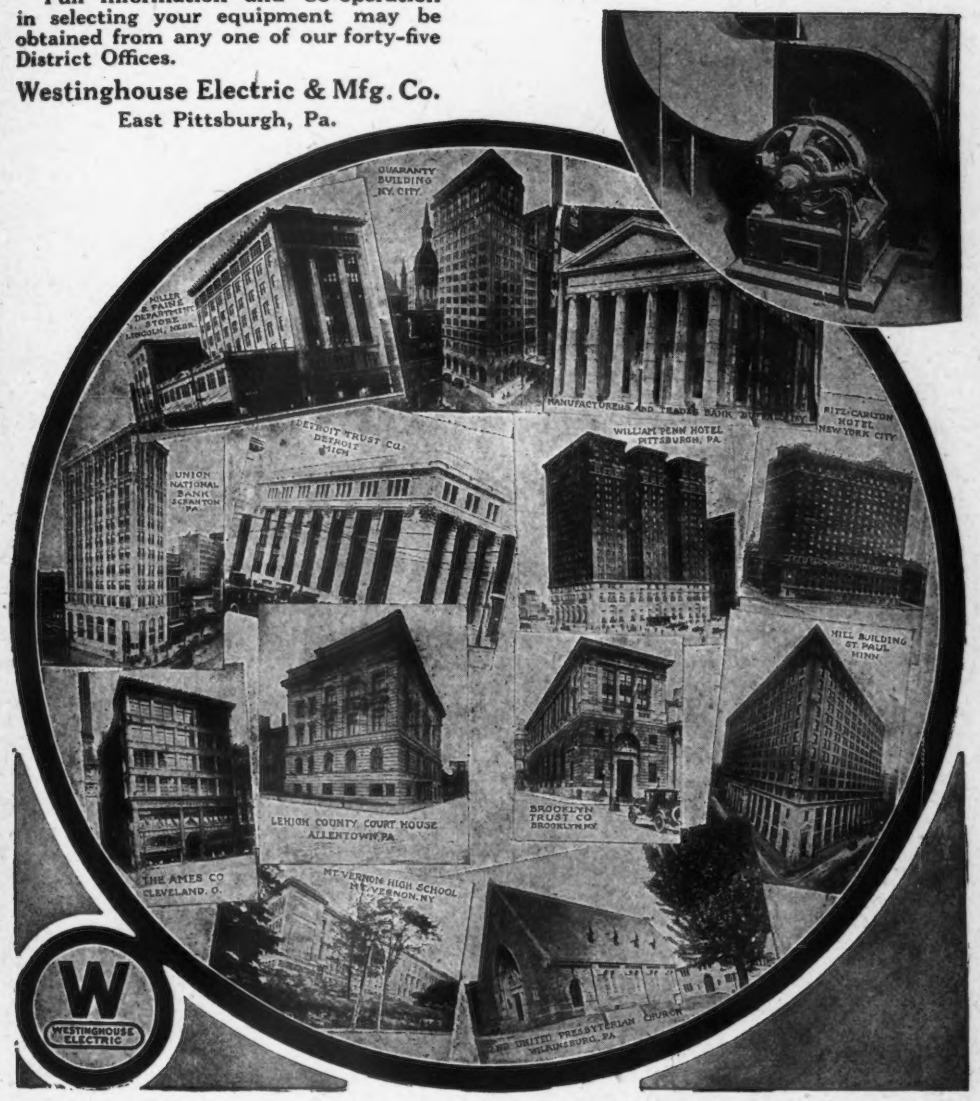
Westinghouse

Ventilating Equipment

Unexcelled in Dependability and Economy of Operation.

Full information and Co-operation in selecting your equipment may be obtained from any one of our forty-five District Offices.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.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WESTINGHOUSE ELECTRIC

an agreement with the consumers to proceed on a flat-rate basis until the matter had been settled in court. Some time ago the Central Illinois Public Service company, which owns the electric light and the heating plant of Taylorville, asked the utilities commission for permission to go from a flat rate to a meter rate. The commission granted the request but ordered that the meter rate be cut 33⅓% because of poor service and ordered that improvements, costing about $16,000 should be made. Both sides appealed the case to the Sangamon county circuit court, with the understanding that the old rate should remain in effect pending a decision.

Thus the matter stood when the company served notice on all consumers that unless the meter rate was paid, the heat would be shut off. When the five days' time granted in the notice had expired, the heat was turned off. As most of the downtown buildings are specially equipped for heating from a central plant it was impossible to procure stoves and thus furnish temporary relief.

A delegation of indignant citizens appeared before the State utility commission and an agreement was finally made whereby the company was to turn on the heat and, in the meantime, an effort will be made to settle the existing differences between consumers and the company.

Springfield, Ill.—Under a ruling by the Illinois Public Utilities Commission increased rates have become effective for hot water and steam heat as well as for gas. The gas rates fixed by the commission are $1.10 per 1000 cu. ft., an advance of 10 cents per 1000 cu. ft. Icreased rates for steam and hot water heating, granted by the commission are as follows:

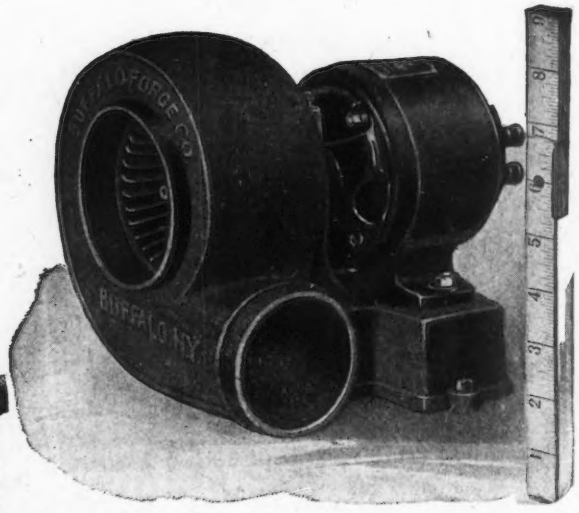
STEAM RATE.—Fixed charge per season of 8.75 cents gross, per square foot of required radiation, plus 45 cents gross per 1,000 lbs. of condensation.

HOT WATER RATE—Charge per season, per square foot of required radiation, 22 cents gross.

Charge per season, per hot water tank, as follows:

15-gal. tank	$ 8.25	gross
20-gal. tank	11.00	gross
30-gal. tank	14.75	gross
40-gal. tank	19.00	gross
50-gal. tank	23.00	gross
60-gal. tank	27.00	gross
80-gal. tank	35.00	gross
100-gal. tank	42.00	gross
110-gal. tank	46.00	gross

A discount of 10% will be made, on the gross bill, when bills for heating service are paid by the tenth of the month following the rendition of the service.



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Taylor Instrument Companies

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There's a Tycos and Taylor Thermometer for every purpose

Rockford Ill.—Rates for steam heat furnished by the Rockford Electric Company will be the same this season as for the year 1917-1918, or 58 cents per 1000 lbs. of condensation.

Manufacturers' Notes.

Parks-Cramer Co., with headquarters in Fitchburg, Mass., is the title of a new humidifier concern, in which the business of Stuart W. Cramer, of Charlotte, N. C., has been consolidated with the humidifier department of the G. M. Parks Company, of Fitchburg. The Cramer plant will be continued as headquarters for the southern business. The application of the Parks and Cramer devices is principally in textile mills and similar buildings requiring air conditioning. The officers of the new corporation are: President, Frederick W. Parks, Fitchburg; vice-presidents, Willliam B. Hodge, Charlotte, and Albert W. Thompson, Lowell; treasurer and general manager, Robert S. Parks, Fitchburg.

American Pressweld Radiator Corporation, Detroit, Mich., announces that the Pacific Coast territory up to San Francisco will be handled in the future by Forrest A. Sutphen, with headquarters in the Metropolitan Building, Los Angeles. The northern coast, including the shipbuilding trade, has been assigned to W. S. Reynolds, with headquarters in the Henry Building, Seattle, Wash. An arrangement has also been made with the Beeman-Ayer Supply Co., Abuquerque, N. M., for handling the Mexican trade.

FOR SALE.

For Sale.—Immediate delivery, second-hand, first-class working condition, one American blower fan, 160 inches, steel-housed, paddle-wheel type, top-horizontal discharge. Capable of delivering 50,000 cubic feet of air at 160 R. P. M., directly connected to 9-in. x 12-in. steam engine.

One set of steam heating coils listed with American Blower Company, No. 40 base, four rows. Each section has a heating surface of 567.8 square feet, in good condition. These coils are used in connection with the above fan for heating. Address International Fabricating Corporation, Wilkes-Barre, Pa.

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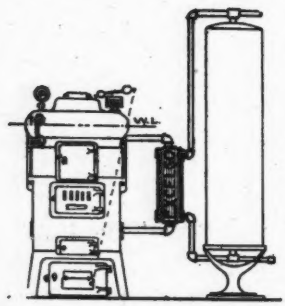

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The Excelso method is approved by all Boiler Manufacturers as being the only successful way of doing away with the old-fashioned, troublesome fire-pot Pipe Coil.

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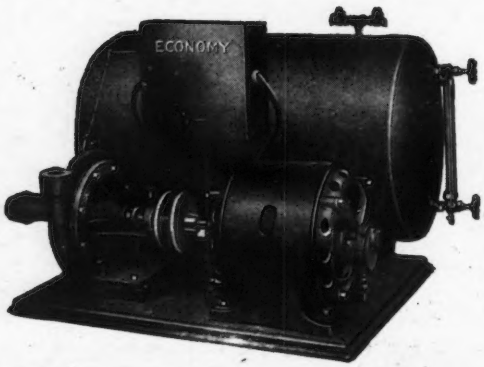

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